AIR CONDITIONING HEATING AND VENTILATING

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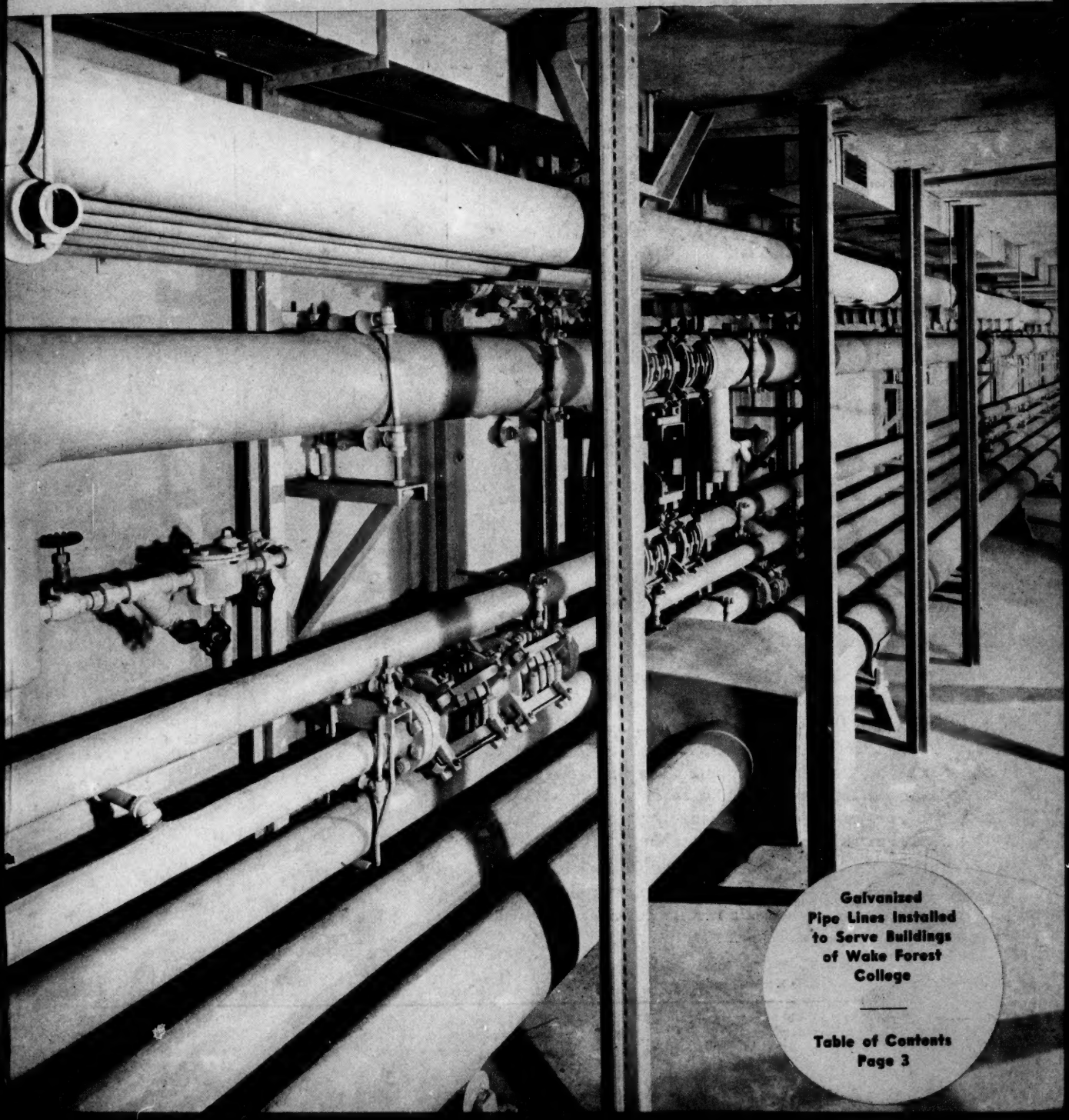
JANUARY, 1957—54th Year



Galvanized Pipe Lines Installed to Serve Buildings of Wake Forest College

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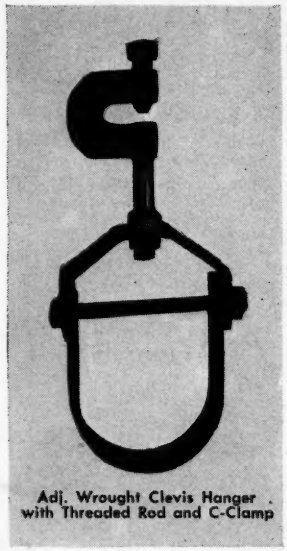
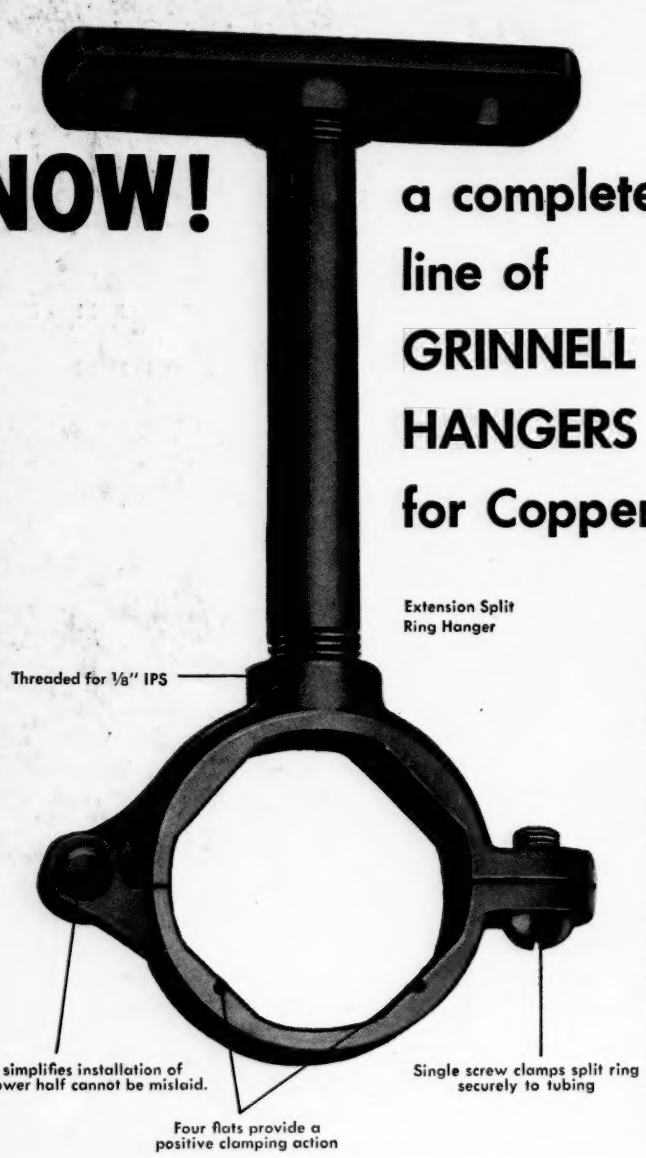
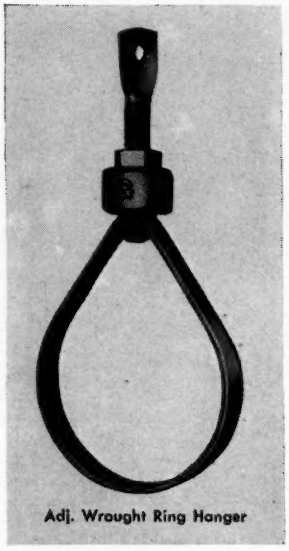
NOW! a complete line of GRINNELL HANGERS for Copper Tubing



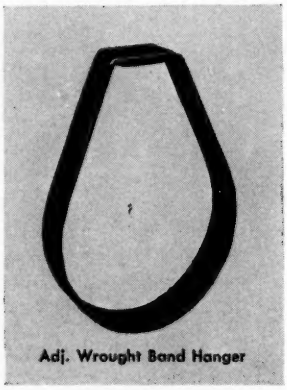
Adj. Wrought Clevis Hanger with Threaded Rod and C-Clamp


Extension Split Ring Hanger
Threaded for ⅛" IPS
Hinge simplifies installation of tubing; lower half cannot be mislaid.
Single screw clamps split ring securely to tubing
Four flats provide a positive clamping action



Adj. Wrought Ring Hanger

Split-Ring with Socket and Coach Screw



Adj. Wrought Band Hanger

Grinnell now offers, in one *complete* line, every standard type of hanger and support for copper tubing. All are heavily copper plated for long, rugged wear. All are accurately sized to fit standard copper tubing, and designed to give a neater installation wherever copper tubing is used.

For dependability, speed, and convenience . . . let Grinnell's coast-to-coast network of warehouses and jobbers serve you as a one-stop source for all your copper tubing hanger requirements. Grinnell-trained personnel are ready to work with you "on-the-job", anywhere, to help solve any problem connected with hangers and supports for copper tubing.

Whether it be for copper tubing or standard pipe, specify Grinnell hangers. No other company makes as complete a line; provides as thorough a distribution service; or can cooperate as fully on *all* your piping assignments.

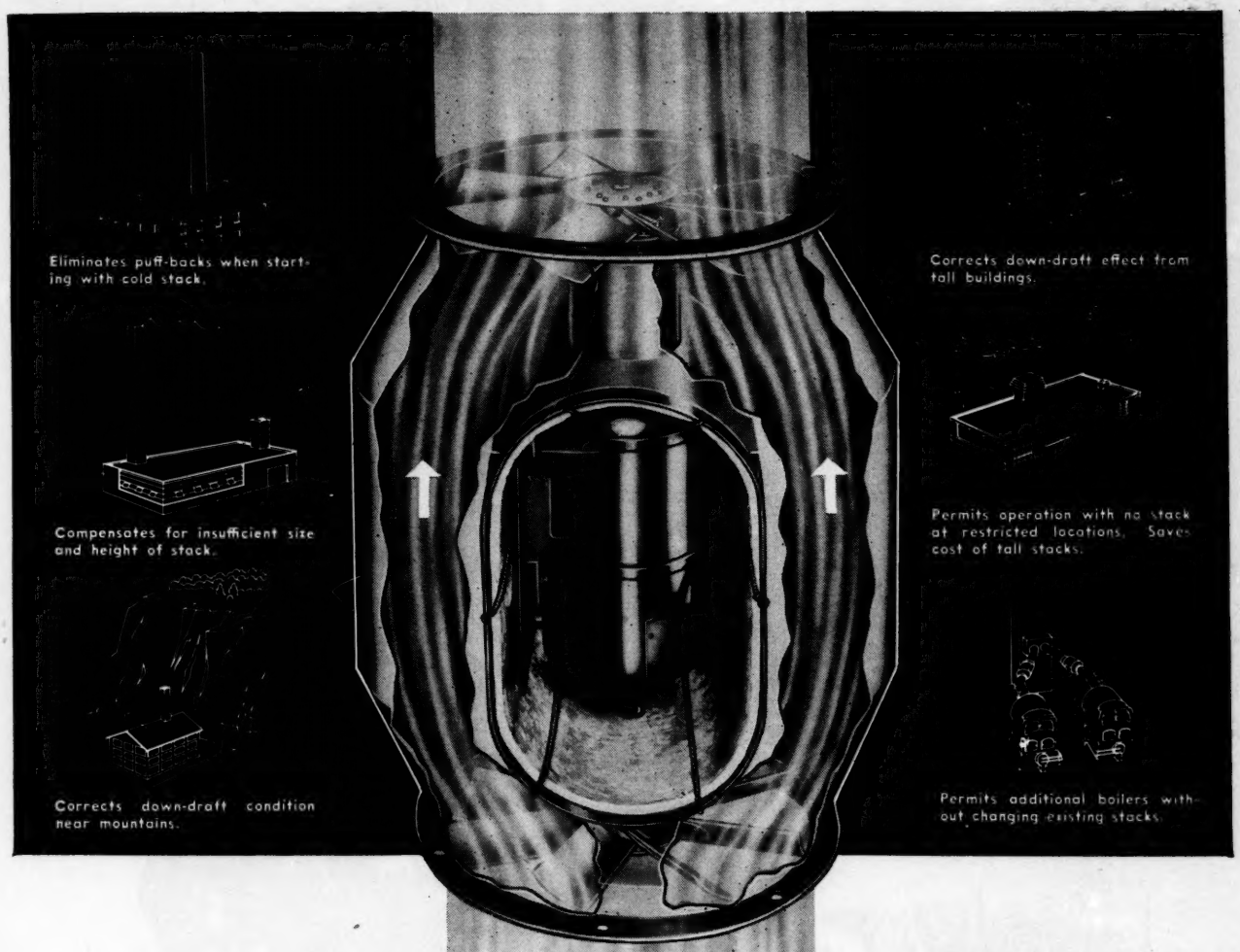
Write for your copy of the COPPER TUBING HANGER Catalog. Grinnell Company, Inc., 218 West Exchange St., Providence, Rhode Island.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

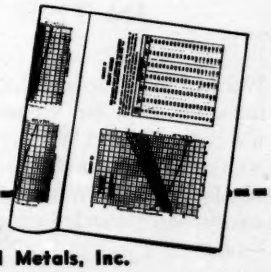
Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems


Eliminates puff-backs when starting with cold stack.
Compensates for insufficient size and height of stack.
Corrects down-draft condition near mountains.
Corrects down-draft effect from tall buildings.
Permits operation with no stack at restricted locations. Saves cost of tall stacks.
Permits additional boilers without changing existing stacks.

Solve these 6 problems with INDUCED DRAFT BIFURCATORS®

Regardless of the problems posed by weather or surrounding conditions, the Induced Draft Bifurcator provides *instant* draft . . . and maintains *constant* draft at the required rate of flow of flue gas through your boiler system.



NEW BULLETIN — MAIL COUPON

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A DIVISION OF
American Machine and Metals, Inc.
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Division of American Machine and Metals, Inc.
East Moline, Illinois

Please send free 20-page bulletin, containing a section "How to select an Induced Draft Bifurcator."

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ATTENTION MR. _____

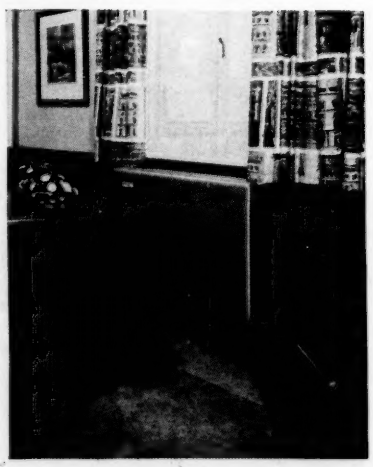
IN THE HANDS OF YOUR WARREN WEBSTER MAN

Webster manufactures heating and cooling equipment. But Webster's finest product is the Warren Webster Man, the man who sells year-round comfort! For, in the hands of your Warren Webster Man, your comfort problems are more than just a job — they're a way of life.

Your Warren Webster Man is pledged to make certain your job is right and that it stays right, always.

Take, for example, this Webster Newport Year-Round Air Conditioner installed in a 20-year-old office building. It's far more than just the answer to your heating and cooling modernization needs. For behind it stands Webster's finest product — the Warren Webster Man. Call him today.

Warren Webster & Company, Camden 5, New Jersey. Since 1888. Offices in 66 Principal U.S. Cities and Canada.



Webster's Finest Product . . . the Warren Webster Man

WARREN WEBSTER

HEATING . . . COOLING

AIR CONDITIONING HEATING AND VENTILATING

JANUARY, 1957

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The Cover: More than 250 tons of Wheeling galvanized pipe were installed for hot and cold water, and sanitary lines serving the buildings of Wake Forest College, Wake Forest, N. C.

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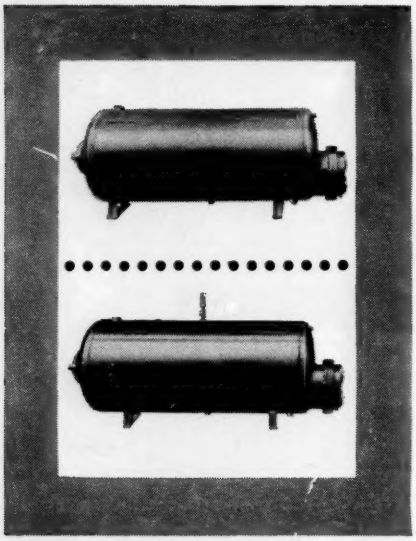
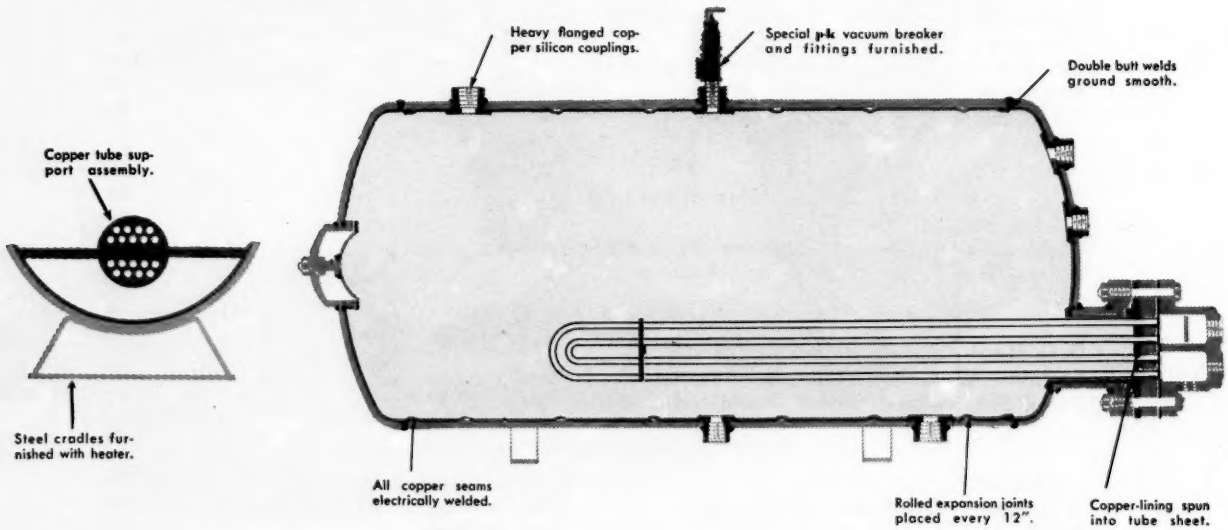


WHICH OF THESE

Copper-Lined HEATERS

WOULD YOU SPECIFY?

ONLY ONE has all these features


Heavy flanged copper silicon couplings.
Special p-k vacuum breaker and fittings furnished.
Double butt welds ground smooth.
Copper tube support assembly.
Steel cradles furnished with heater.
All copper seams electrically welded.
Rolled expansion joints placed every 12".
Copper-lining spun into tube sheet.

Like twins, copper-lined heaters can look pretty much alike—on the outside. But *inside*, and on key points of construction, they can be as different as day and night.

Engineers experienced in copper-lined heaters are aware of these vital differences and specify accordingly.

They insist, for instance, on rolled joints every 12 inches around the full circumference of the lining to allow for longitudinal expansion . . . on the copper-lining being not less than 3 lb. per square foot . . . on heavy flanged copper silicon couplings, welded to both the shell and the lining . . . on enough tube supports . . . on an adequately long tube bundle with parallel "U" bends . . . and on a vacuum breaker valve to protect the lining from sudden pressure fluctuation. They make sure that separate hydrostatic and pneumatic tests are run to guarantee that linings will be leakproof.

These experts specify these details, and others, found only in P-K heaters, because they know that heaters built *without* such safeguards are false economy; but that heaters "built right," like P-K's "Indestructo" copper-lined heaters, assure trouble-free service year after year.

Like the full story? We've detailed the key construction features in sample specifications and in P-K's new Catalog 19. Ask your local P-K representative for copies or write today.

The Patterson-Kelley Co., Inc., 910 Burson Street, East Stroudsburg, Pa.

Patterson-Kelley

2598

storage water heaters • instantaneous heaters • convertors • fuel oil heaters • freon chillers and condensers

HIGH SPOTS

• In a year-end statement, George S. Jones, Jr., Managing Director of the Air Conditioning and Refrigeration Institute, stated that the **air conditioning and refrigeration industry** has just experienced its **best year to date** and looks forward to **greater records in 1957 and the years to follow.** Factory air conditioning, which has progressed on a steepening curve during the past several years, is due for a big upsurge in the next few years. A survey, covering architects and consulting engineers in all sections of the country, foresaw construction of most new factories with initial air conditioning as well as the conversion of many existing plants. Virtually all new office buildings on the drawing boards call for initial installation of air conditioning equipment. In addition, hospital air conditioning will also be a big feature in future sales and installations of cooling equipment as medical authorities uncover the therapeutic value, aside from the comfort standpoint for patients and employees, of air conditioned environment.

• American industry will buy **more ultrasonic equipment in 1957** than in all previous years it was predicted at an ultrasonic symposium jointly sponsored by Acoustica Associates, Inc., Glenwood Landing, L. I., and Mullard, Ltd., of England. Ultrasonic systems will find **applications in almost every field of industry.** Presently available ultrasonic devices include a drill for cutting intricately shaped holes in the hardest materials, and a no-flux soldering iron as described this month in News of Equipment and Materials.

• **Revision of plumbing standards** necessitated by advances in the field of plumbing technology is being considered by **U. S. Public Health Service Technical Committee on Plumbing Standards** which met for the first time in November. Represented were eight national organizations and the Public Health Service to plan development of a plumbing standard adequate to the needs of the nation's health. The Committee will meet again within four months to review tentative drafts expected to be prepared by that time.

• Manufacturers' **shipments of compressor bodies** used in air conditioning and refrigeration units (exclusive of those for household refrigerators) were up almost 37% during the first 8 months of 1956, as compared with the same period during 1955, **ARI** reports.

• **NEMA** reports that **electric heating of all types** will consume 4.2 billion kwh this year, and that the figure will jump to 11.9 billion in 1960 and 77.6 billion by 1970, at which point it will represent 15% of all electricity consumed in homes.

• **Electric resistance heating** serves the entire heating needs of 250,000 homes and 18,000 commercial establishments, according to H. M. Brundage, general manager of Weathertron Dept., General Electric Company. Total will be 300,000 in 1957. Also, heat pump installations will grow from today's 12,000 to 24,000 in the next year, he predicted.

• Dollar volume of **construction contract awards** in 1957 will set a new record 7% above this year's total, according to estimates released today by F. W. Dodge Corp., construction news and marketing specialists. Physical volume of construction would not rise as rapidly as the dollar volume, because of rising construction costs. Contracts for total building in the 37 eastern states next year are estimated at $20,393,000,000, the highest in history and 6% above the estimate for 1956. Physical volume, as measured by floor area, may be up only 1%, but again this will be the highest level in history. The **residential outlook** is for a small increase in the number of new non-farm dwelling units started, to about 1,125,000. This would be reflected in a 6% increase in dollar volume, due to rising costs, and no increase in total floor area, because of the likelihood of a slightly smaller average house next year.

WASHINGTON OVERTONES

by LORING OVERMAN

What does 1957 hold for the air-conditioning, heating and ventilating industries?

• Barring international complications, the outlook is extremely favorable, according to a year-end symposium on the business outlook conducted by the United States Chamber of Commerce. Encouragement is found in such forecasts as these:

• "Work on drawing boards indicates a bright 1957 for building." So says Edmund R. Purvis, Executive Director, American Institute of Architects.

"Continued industrial expansion; unfilled needs in educational, health and ecclesiastical fields, and federal, state and municipal public building expansion . . . represent a challenge to all concerned with the construction industry."

The spokesman for architects also had this to say:

"While tight money has caused some difficulties in financing new construction, only those concerned with speculative home and commercial building seem to have been hurt much."

Economies in building may be available, the architects said, through employment of prefabricated components. The word "components", was stressed as referring only to advance-built units ready for quick installation.

Housing Controversial. Opinions in Washington differ as to effects of the tight-money policy. Federal Reserve considers credit brakes necessary to prevent inflation.

Housing's chief spokesman—John H. Dickerman, Executive Director, National Association of Home Builders—says it's toughest on the little fellow.

• Buyer of low cost housing finds **mortgage money virtually nonexistent,** Dickerman observes. Current trend is toward fewer and more costly houses. Median price of 1957 will be $15,200 as compared to $14,700 in 1956.

• Most of the home building industry's production slump, Mr. Dickerman said, has been in the FHA-VA field.

Congress Won't Like It: Ever respectful of the vote-voice of the veteran and the Joe Smiths, Congress will undoubtedly call for some special sort of **relief for the small borrower.** The NAHB spokesman, while hoping for favorable Federal action in the mortgage field, had this to say for '57:

"On the basis of what we know—and leaving Government out of it—the home building industry will move in 1957 at an annual rate of production of less than one million starts. After a slow start there will be, I believe, **a pickup somewhere along the way.** If this takes place, as I expect, our industry will start, for the eighth consecutive year, one million or more new houses in 1957."

Consumer Credit Outlook: What about consumer credit—the money reservoir for purchases of packaged air-conditioners and the like?

• Forecast of what will happen to the volume of consumer purchases in 1957 "is more difficult than usual", according to William J. Cheyney, Executive Vice President, National Foundation for Consumer Credit.

• Use of consumer credit follows a decision to purchase, Mr. Cheyney pointed out. Buyers do not, he observed, determine how much credit they can get, and then use it all up in purchases. It is the other way 'round.

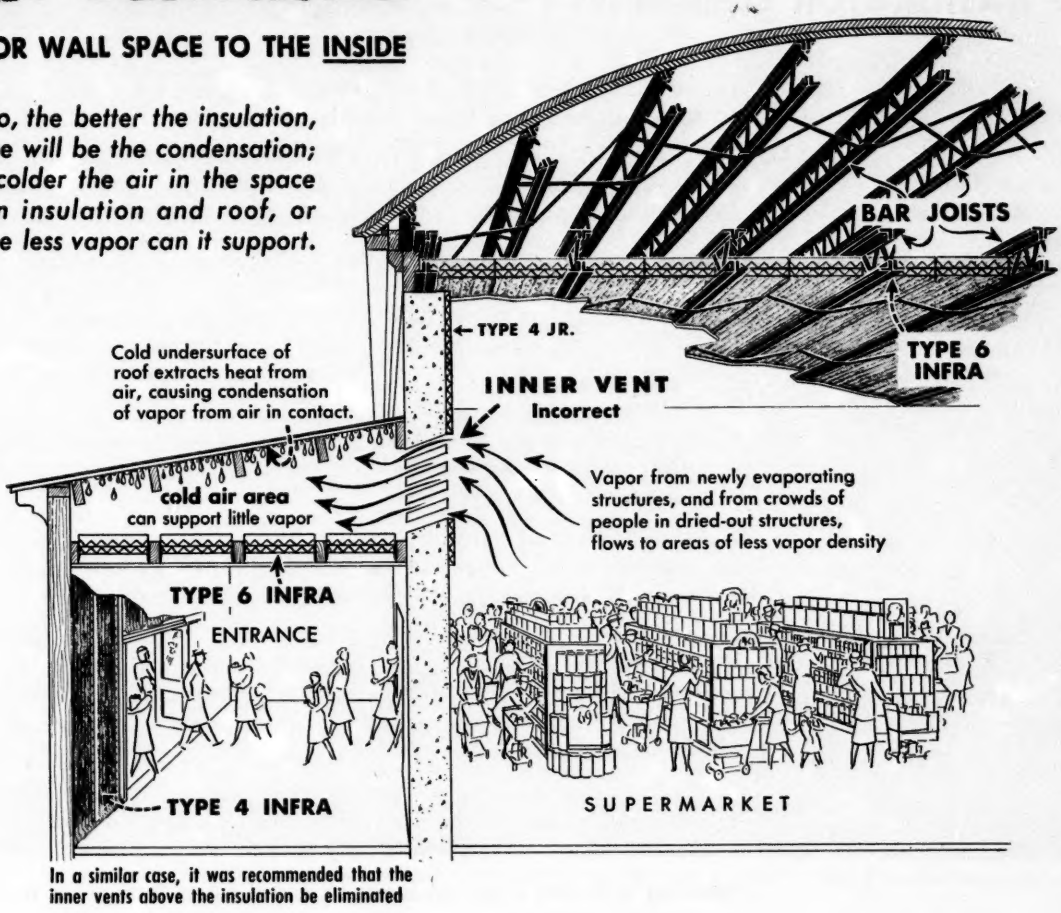
• "We may be close to resistance points," he said. "It is my opinion that the **distribution economy will have to work harder** than ever to open up consumer sales in 1957, particularly in heavy goods. Profits will be squeezed. I think before the year-end that manufacturers will realize that this squeeze cannot all come

(Concluded on page 8)

NEVER VENTILATE

A CEILING OR WALL SPACE TO THE INSIDE

If you do, the better the insulation, the worse will be the condensation; for the colder the air in the space between insulation and roof, or walls, the less vapor can it support.


BAR JOISTS
TYPE 4 JR.
TYPE 6 INFRA
Cold undersurface of roof extracts heat from air, causing condensation of vapor from air in contact.
INNER VENT
Incorrect
Vapor from newly evaporating structures, and from crowds of people in dried-out structures, flows to areas of less vapor density
cold air area
can support little vapor
TYPE 6 INFRA
ENTRANCE
TYPE 4 INFRA
SUPERMARKET

In a similar case, it was recommended that the inner vents above the insulation be eliminated

In new construction, moisture evaporates from many tons of cement and plaster. Vapor flows from areas of greater density into this small, cold space of less vapor density and small vapor capacity.

Where scientific multiple aluminum is used, fortuitous vapor and water (for instance rain) will gradually flow out, as vapor, through exterior walls and roofs as vapor pressure develops within. The vapor cannot back up through the continuous, almost impervious aluminum. It will flow out because walls and roofs have substantial permeability by comparison, far greater than the required 5 to 1 ratio. Infiltration under the flat stapled flanges of multiple aluminum is slight.

Unusual amounts of vapor, as from crowds in theatres, churches, schools, stores, etc. must be adequately vented to the outside. Each person breathes out and perspires vapor, winter and summer, at the rate of 3 lbs. a day.

To obtain MAXIMUM, **uniform-depth** protection against heat loss and condensation formation, use the **edge-to-edge** multiple aluminum, **each** sheet of which stretches from joist to joist.

The U.S. National Bureau of Standards has prepared a helpful and informative booklet, "Moisture Condensation in Building Walls" which discusses causes and cures. Use the coupon and we will send a free copy.

THERMAL VALUES, INFRA TYPE 4S

Up-Heat	C .105 = 3⅛"	non-metallic insulation*
Wall-Heat	C .068 = 4¾"	non-metallic insulation*
Down-Heat	C .042 = 7⅞"	non-metallic insulation*

*Based on limiting values of Fed. Spec. HH-I-521c

Cost installed between wood joists, material and labor, about 8¢ sq. ft.

Type 6 also available

Can be purchased everywhere through your preferred local dealer.

Infra Insulation, Inc., 525 Bway., N. Y. C. Dept. V-1
Send "Moisture Condensation in Building Walls."

Name_____

Firm_____

Address_____

WASHINGTON OVERTONES *(Concluded from page 6)*

out of the pockets of retailers, and that it cannot forever be passed on to the consumer in continuing higher and higher prices.

• "The feeling that increased factory wages, unaccompanied by increased manpower productivity, can be paid without any dampening effect upon sales at the factory level, indeed may be challenged rudely before 1957 is finished."

Federal Action?: "One of the factors affecting any business forecast," summarizes the US Chamber's economic spokesman, "is the state of legislation affecting the economy. What the new Congress does, for example, in such areas as tax relief, labor legislation, Hoover Commission economy recommendations, farm programs, federal aid to school construction, etc., will definitely affect our economy in 1957."

• The Chamber is urging **all businessmen to interest themselves in proposed legislation affecting business,** whenever it is placed on the Congressional agenda. Among the many subjects of interest:

Tax Cuts Unlikely: Despite pre-election promises, the possibility of tax cuts grows less and less likely. Two Ways and Means Committee sub-committees—Excises and Internal Revenue—have completed hearings. Neither is expected to recommend tax cuts.

• One sub-committee studying excises has indicated it will recommend procedural changes to correct inequities. Unless extended by Congress, a long list of excises is slated to expire April 1. **Treasury has warned against any tax cuts** which might result in an overall reduction of Federal revenues.

• The Mills subcommittee studying Internal Revenue, likewise has indicated there is little hope for income tax cuts. Even small business—virtually promised some sort of tax relief—is being told it may have to wait until later, much later.

Spending is Easier: Congress seems to find it easier to increase its spending than to curtail expenditures.

• Of interest is a proposed "crash program" of **school construction.** Drafted by Senator Pat McNamara, the plan would appropriate $2 billion of federal funds over a two-year period—to be matched by state funds—to construct 105,264 new classrooms. Shortage is now estimated as 247,000 rooms.

• The McNamara proposal contains a proposal which might avoid the "segregation" dispute credited with wrecking the $1.6 billion school bill in the 84th Congress. His proposal would specifically forbid the Federal Government from exercising any control over the "personnel, curriculum or program of any school or school system."

• A stepped up program of **hospital construction** is also under consideration.

• **Defense budget is to be upped** a couple of billion dollars.

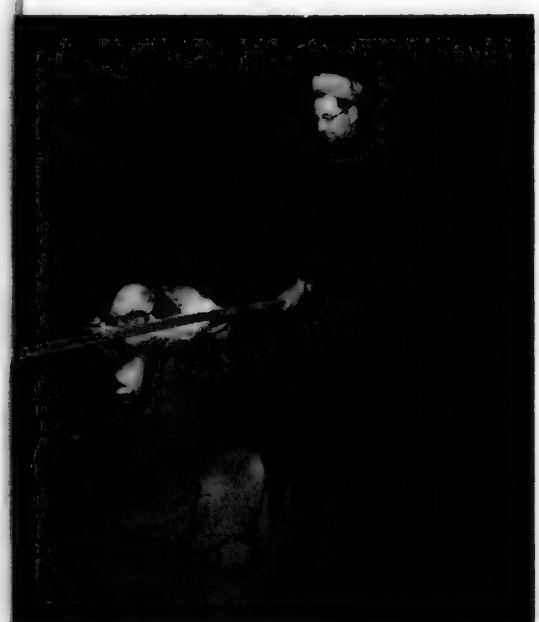
• Crises in Suez and the Middle East involve increased expenditures for foreign aid.

• Other "spend more" programs involve Federal assistance to cut unemployment in distressed areas of the US; extensions of the Social Security System; Federal assistance for hospital construction, with special reference to low-cost care of chronic cases and the aged; increased Federal aid for the needy and to help train more physicists and scientists; legislation to improve farm prices and to aid drought areas.

• All of these programs, and many more, **involve increased expenditures**—few curtailments. Several promise quick dividends in added business for those affiliated with the construction industries. Whatever else may be said for 1957, it promises to be exciting, challenging, and expensive.

52,000 feet of wrought iron pipe provide built-in protection against corrosion for ice skating rink at new Kentucky Fair and Exposition Center, Louisville.

Ten miles of Wrought Iron Pipe checks corrosion at this ice skating rink



Testing of 3,500 welds in this wrought iron rink piping revealed only two leaks.

Carrying brine for ice skating rinks is one of the most corrosive services a piping material can encounter.

To check corrosive attack in this service at the Kentucky Fair and Exposition Center's Coliseum at Louisville, designers specified 52,000 feet of 1-inch wrought iron rink piping. This time-tested material was also installed in the Center's condensate returns, pump discharge and high pressure and medium pressure return lines.

Wrought iron's glasslike silicate fibers provide built-in resistance to corrosive agents. This exclusive protection—found only in wrought iron pipe—checks premature piping failure, abnormal maintenance and excessive repairs. No protective coatings are needed either.

Service records document wrought iron's qualifications for this service. Many of these case histories are covered in our Special Report, *Ice Skating Rinks—Their Construction and Maintenance.* Write for your copy today.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Division Offices in Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N.Y.

Available in Canada and throughout the world

Kentucky Fair and Exposition Center Ice Skating Rink
Architects: Fred Elswick and Associates, Louisville
Contractor: Ward Refrigeration and Engineering Company, Louisville
Mechanical Engineers: E. R. Ronald and Associates, Louisville

BYERS Wrought Iron Tubular and Hot Rolled Products

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

BRIEFLY STATED

• **M. K. Fahnestock,** research professor of mechanical engineering and chairman of the Physical Environment Unit of the University of Illinois, has been selected to receive the F. Paul Anderson Medal, highest award of the American Society of Heating and Air-Conditioning Engineers. The medal is awarded by the Society in recognition of outstanding work in the field of heating, ventilating and air conditioning.

• Appointment of **Harry Alter Co., Inc.,** as Chicago distributor of its products was made by **Airtemp Div., Chrysler Corp.,** Dayton, Ohio. Room conditioners are not included. Its commercial and residential equipment is available in the Chicago area from one distributor for the first time.

• Johnson Service Company, Milwaukee, Wis., manufacturers of automatic temperature control systems, has appointed **James W. Taylor** formerly with the firm's Houston branch, sales engineer in charge of its Memphis branch. He replaces R. L. Elbrecht who is on leave of absence. **Robert C. Wang,** sales engineer in charge of the Sacramento office, has joined the sales engineering staff of the San Francisco branch.

• **Keystone Div., Dravo Corp.,** Pittsburgh, Pa. has been named regional distributor for glass fiber insulation products of the **Gustin-Bacon Mfg. Co.,** Kansas City, Mo. Distribution area will include 28 counties in western Pennsylvania, 9 in West Virginia, 4 in Ohio, and 2 in Maryland.

• **Lee A. Miles** has been appointed to the newly-created position of assistant to the field sales manager of Mueller Climatrol, a subsidiary of Worthington Corporation, it was announced. He joined the firm nine years ago as cooling application engineer and later became a sales engineer. Active in National Warm Air Heating & Air Conditioning Association, he has been instrumental in developing most of the air conditioning technical material for use by the industry.

• Five prominent members of professional distinction, including 3 past presidents, recently were honored when the Council of the American Society of Heating and Air-Conditioning Engineers conferred on them the grade of Fellow. The members are **Walter L. Fleisher,** New York; **L. N. Hunter,** Johnstown, Pa.; **J. Donald Kroeker,** Portland, Ore.; **Charles S. Leopold,** Philadelphia, Pa., and **Samuel R. Lewis,** Chicago, Ill. Society president John W. James will present the awards at the 63rd Annual Meeting, February 25-28, 1957, at Chicago, Ill.

• Joseph L. Block, President of **Inland Steel Co.,** Chicago, Ill., announced the company is now in a three-year 280 to 290 million dollar expansion program. Most of that work is in progress at the company's Indiana Harbor works, with a vast expansion program also underway in development of the company's iron ore project in Ontario, Canada, and the construction of a new office building in Chicago.

• American Blower Corp. announced with regret the death of **Lance L. Simmons,** Executive Engineer of the firm. Mr. Simmons was a past president of the Heating and Cooling Coil Manufacturers' Association and a member of the American Society of Refrigerating Engineers.

• The board of directors of Acoustica Associates, Inc., Glenwood Landing, L. I., N. Y., has announced the election of **Paul M. Platzman** as Vice President of Sales and Manufacturing. The firm, a manufacturer of ultrasonic equipment, also announced the appointments of **Harold P. Baker** to the position of Vice President and Treasurer, and **Ralph Reynolds** as Technical Sales Manager.

• **Charles E. Bulloch** has been named to the newly created position of Director of Product Development for the A. O. Smith Corp., Milwaukee, Wis. Mr. Bulloch's duties will include exploring new product applications and markets, with particular emphasis on the field of glass fused to steel.

• Recent appointments included **Carl Swanson** as product manager and **Russ Keppel** as market manager for Minneapolis-Honeywell Regulator Co. commercial and industrial burner controls.

• The Vilter Manufacturing Co., Milwaukee, Wis., announced the opening of a sales office in Houston, Texas, and the appointment of **George E. Brenton** as District Manager of the new office.

• One of the largest pipe fabricating operations in the country was created when **Houston Pipe & Steel, Inc.,** Houston, Texas, joined forces with the **Flori Pipe Co.,** St. Louis, Mo., as a combined operation of their parent company, the **Sparton Corporation** of Jackson, Mich.

• **Frank J. Gleason** has been named President of Copeland Refrigeration Corp., Sidney, Ohio. He succeeds **Harry E. Thompson,** whose resignation was accepted by the corporation's board of directors.

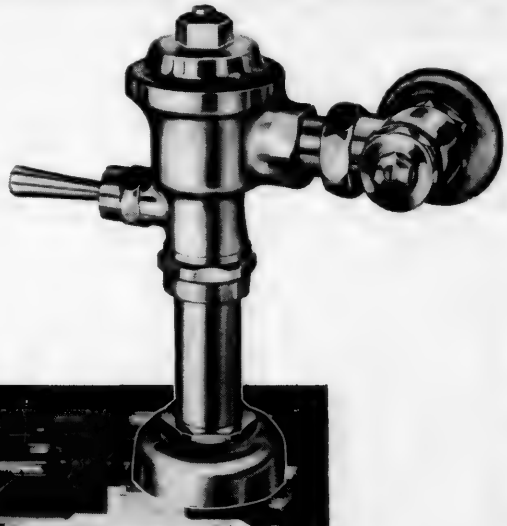
• Magnethermic Corp., Youngstown, Ohio, announced the following appointments: **B. E. McArthur,** Chief Engineer of the company since 1951, appointed Vice President in Charge of Engineering; **T. R. Kennedy** appointed Chief Engineer; **Herman C. Dustman** appointed engineer in charge of radio frequency heating.

• **Donald R. Meckstroth** has been appointed manager of marketing for the package products department of the Westinghouse air conditioning division. Mr. Meckstroth succeeds **John A. Gilbreath** who has been named manager of the newly organized air conditioning wholesaling department.

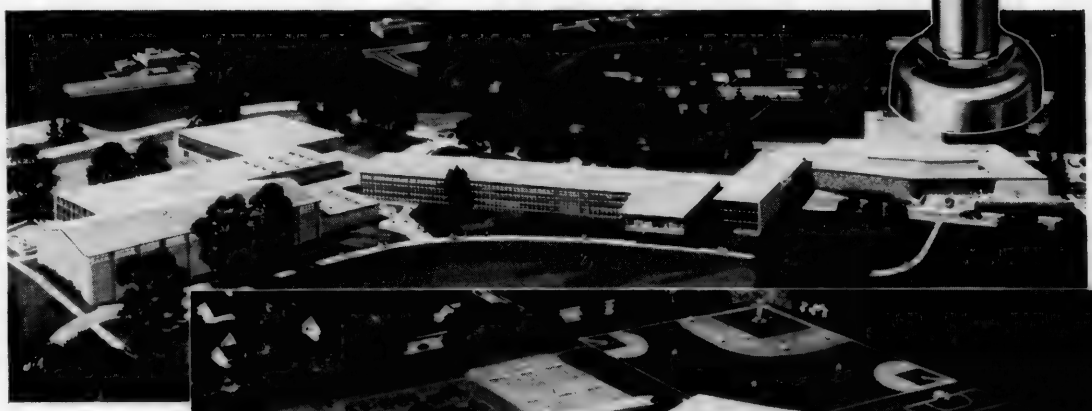
• Fasco Industries, Inc., Rochester, N. Y., has appointed **William F. Purves** Director of Engineering in charge of all engineering operations. Mr. Purves has been Chief Engineer at the firm since 1953.

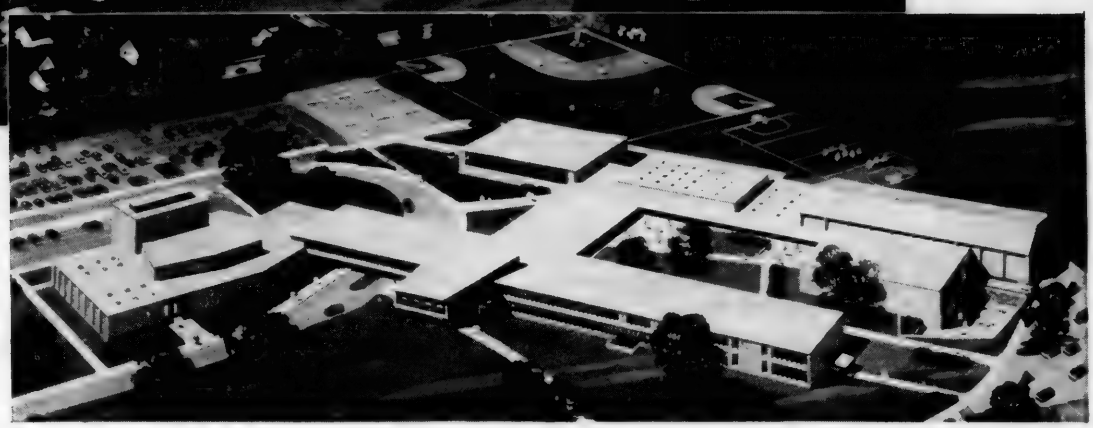
(*Concluded on page* 12)

And in Cedar Rapids– A FUTURE OF FAULTLESS SERVICE



GEORGE WASHINGTON HIGH SCHOOL
& THOMAS JEFFERSON HIGH SCHOOL
Cedar Rapids, Iowa
LEO A. DALY COMPANY
architect and engineer
NATKIN & COMPANY
plumbing contractor
CHANDLER COMPANY
wholesale distributor
KOHLER CO.
plumbing fixtures manufacturer





Straddling the eastern and western banks of the Cedar River, this handsome pair of high schools – designed and constructed simultaneously at a cost of $8,000,000 – will soon join the Cedar Rapids educational system. Here, eye arresting exteriors reflect the high quality of the mechanical equipment within.

In both projects, COYNE & DELANY diaphragm type flush valves were selected to provide the enduring service that school operations demand. Rugged in construction, consistent in performance, the superiority of DELANY valves may be traced to new and proven engineering concepts, many of them patented. Because there is no equal to the advanced design of DELANY valves, DELANY stands today, nationally and internationally – "the fastest growing name in flush valves!"

This new "HAND BOOK and CATALOG No. 53" is the most comprehensive of its kind–designed for everyday reference . . . 19 pages of installation details for exposed, concealed and special FLUSH VALVE installations . . . over 75 blue prints . . . cut away views . . . many pages of charts, formulae, piping details . . . sent free, if requested on firm letterhead.

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK
IN CANADA: THE JAMES ROBERTSON CO., LTD.

DELANY *Flush* VALVES

Since 1879

BRIEFLY STATED

(*Concluded from page* 10)

• **Frederick M. Rutledge** was appointed Manager of Project Engineering of The Hays Corporation, Michigan City, Ind. Mr. Rutledge was formerly Chief Control Engineer of the company.

• **Henry F. Dever,** president of Brown Instruments Division of Minneapolis-Honeywell, has been given corporate responsibility for directing the parent company's activities in the industrial controls field. Mr. Dever will be responsible for the over-all planning in industrial controls and will counsel and coordinate the engineering and manufacturing operations of seven M-H divisions now active in this field.

• **Richard A. Matheis** has been promoted to manager of The Trane Company sales office in Cincinnati, Ohio. Mr. Matheis has been doing sales work with the company since 1947.

• **William H. Smith** has joined Perfection Industries, Division of Hupp Corp., Cleveland, Ohio, as assistant to the heating and cooling sales manager. Mr. Smith will help develop the expanded sales program for 1957 residential, commercial and window air conditioner business.

• **John W. Stribling** has recently been made Consultant in Mechanical Engineering in Plant Engineering and Maintenance Service for General Electric Co., Schenectady, N. Y.

• **Flexonics Corporation,** Maywood, Ill., announced acquisition of the **Flex-O-Tube Division of Meridan Corp.,** Inkster, Mich., to provide one line of flexible hose and fittings of all materials for industrial use.

• **Henry B. Williams** has been appointed Chief Engineer of McQuay, Inc., Minneapolis, Minn. Mr. Williams has been with the company since 1943 in various engineering capacities and has had twenty years of experience in the refrigeration, heating and air conditioning industry.

• A departure from normal procedures in pricing electronic air cleaning equipment, as well as price reductions was announced by **Trion, Inc.,** Pittsburgh, Pa. E. W. Meyers, president of the firm, said the company will put into effect immediately a program of prices for electronic air cleaning equipment that will be based on the specific piece of equipment rather than on capacity in cfm. This is an innovation in the industry which customarily bases all pricing on capacity of the installation.

• University of Wisconsin student **Ronald L. Kausch** recently received from the Wisconsin Chapter, American Society of Heating and Air Conditioning Engineers the first G. L. Larson Award established in memory of the late Gustus L. Larson. The recipient of the award is a senior in mechanical engineering.

• The 1956 Worcester Reed Warner Medal of the American Society of Mechanical Engineers was conferred upon **James Keith Louden,** Fellow, ASME, in recognition of the unique and valuable contributions made by his book, Wage Incentives, and other publications. The presentation was made at the Banquet of the Annual Meeting of the Society on November 28, 1956.

• **Robert Wright, Jr.,** has been named technical sales representative on Freon refrigerants and aerosol propellents for the Du Pont Company's Kinetic Chemicals Division in the St. Louis area. In addition **John H. Grant** has been named sales correspondent in the New York district office for the division.

• **S. A. Bunis** of Goulds Pumps, Inc., Seneca Falls, N. Y., has been appointed Assistant General Sales Manager. Associated with the company in a sales capacity since 1936, Mr. Bunis formerly served as manager of the water systems sales department.

• **Frank A. Haag** has been appointed manager of automotive refrigeration of Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio. Mr. Haag will be responsible for engineering, marketing and application engineering of refrigerant compressors and related devices for the automotive market.

• **Owen Kuhen** has been named product specialist for Carrier Corporation's large-capacity absorption refrigeration equipment. All of Mr. Kuhen's business career has been devoted to air conditioning using absorption cooling. **Victor Cole,** who has been associated with development and sales of the absorption units moves to the firm's Southwest region as sales engineer.

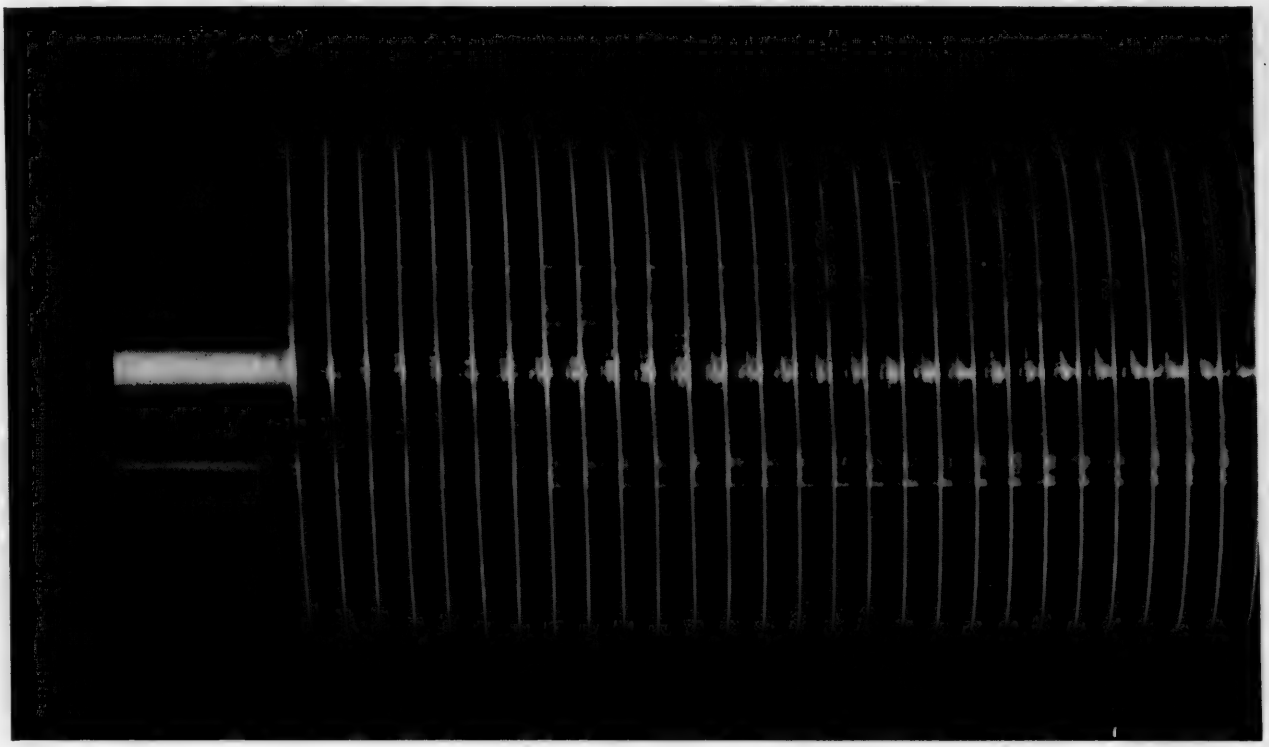
• **Victor Mauck,** dean of the automatic water heater industry, and until last January, chairman of the boards of the John Wood Co. and Nicolet Industries, Inc., died at the age of 82 on December 2 in Bryn Mawr Hospital, Philadelphia, Pa.

• **John Schwaller** has been named advertising and promotion manager of Ramset Fastening System, a division of Olin Mathieson Chemical Corp., Cleveland, Ohio. Mr. Schwaller was formerly assistant advertising and sales promotion manager.

• **Martin B. Beline** has been appointed Vice President of Spi-Rol-Fin Corp., Pequannock, N. J. The firm markets heating equipment, such as baseboard radiation and steel boilers. In this new post, Mr. Beline will head the development of new markets.

• **Johns-Manville Corp.** began manufacturing operations serving the southeastern United States with the formal opening of a new asphalt shingle and roll roofing plant at Savannah, Ga.

• **Rovan A. Wernsdorfer** has been appointed Northeastern Regional Service Manager and **Robert A. Brown** has been named Central Regional Service Manager of the Black & Decker Manufacturing Co., Towson, Md.



AEROFIN
Smooth-Fin Coils offer you

Greater Heat Transfer
per sq. ft. of face area

Lower Airway Resistance
—less power per c.f.m.

Aerofin smooth fins can be spaced as closely as 14 per inch with low air friction. Consequently, the heat-exchange capacity per square foot of face area is extremely high, and the use of high air velocities entirely practical. Tapered fin construction provides ample tube-contact surface so that the entire fin becomes effective transfer surface. Standardized encased units arranged for simple, quick, economical installation.

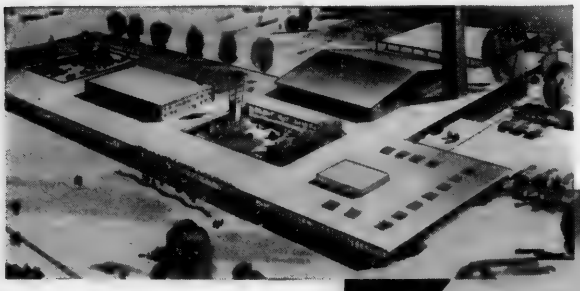
Write for Bulletin S-55

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

POWERS Control ..



One of 8 Wyandotte schools using Powers Temperature Control.

"A School Without Study Halls or Homework; each class period is used partly for study, and the ideal is to make the work so engrossing for students that they will pursue it voluntarily."

The building surrounds two courts or patios, one of which is shown at right. It has sheltered tables with benches, planting beds and a sundial.

The old bell served the previous Lincoln Junior High School for 50 years.

ABRAHAM LINCOLN JUNIOR HIGH SCHOOL, Wyandotte, Mich.

Architects and Engineers: EBERLE M. SMITH ASSOCIATES, Inc., Detroit

Heating Contractor: L. L. McCONACHIE COMPANY, Detroit

Below: **Wyandotte Memorial Pool, Wyandotte, Mich.**

Architect: ROBERT L. SVOBODA, Detroit

Mechanical Engineer: THOMAS J. BLACK, Detroit

Heating Contractor: GLANZ & KILLIAN, Detroit, Mich.

Right: Powers Recording Psychrometer provides chart records of dry bulb and wet bulb temperatures.

→

(C-80)

...used in this school "planned for effective learning"

Among its many noteworthy features the Abraham Lincoln Junior High School has FLEXIBILITY... to permit altering classroom size to accommodate future curriculum changes. Classrooms have non-load-bearing partitions which can be relocated. Heating and ventilating is supplied from prefabricated acoustical radiant ceiling panels which can be rearranged to permit future changes.

Versatility of Powers Temperature Control is demonstrated in this outstanding school and the natatorium shown below.

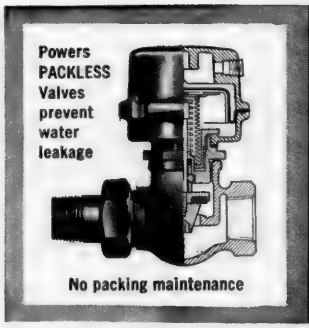
The heating and ventilating system is divided into six zones depending on function of each area. The Powers control system permits normal daytime operation of any zone or zones while the balance of the building remains on economical night control.

Individual Room Control—Each room is equipped with a Powers Day-Night thermostat which modulates a Powers *packless* valve on the ceiling radiant heating coil. A Powers MASTROL system regulates the temperature of the forced hot water supplied to the ceiling coils. The classroom ceilings consist of perforated snap-on metal pans suspended from radiant heat coils above which a glass fiber blanket provides insulation and acoustical absorption. The space between is an air plenum from which ventilating air is forced through the ceiling perforations into the classrooms.

Powers PACKLESS Valves a Must—They prevent leakage of water on ceiling and eliminate packing maintenance. Because they have no packing nut or gland to be tightened, oiled or adjusted, there is no binding of valve stem and they give better control.

Ventilation is regulated by Powers controlled fan units located throughout the building.

If You Are Planning a New School or remodeling an old one, ask your architect or engineer to include a Powers Quality system of temperature control. You will help insure utmost comfort and lowest upkeep cost.



For further information contact our nearest office

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in Chief Cities in U.S.A., Canada and Mexico*

65 Years of Automatic Temperature and Humidity Control

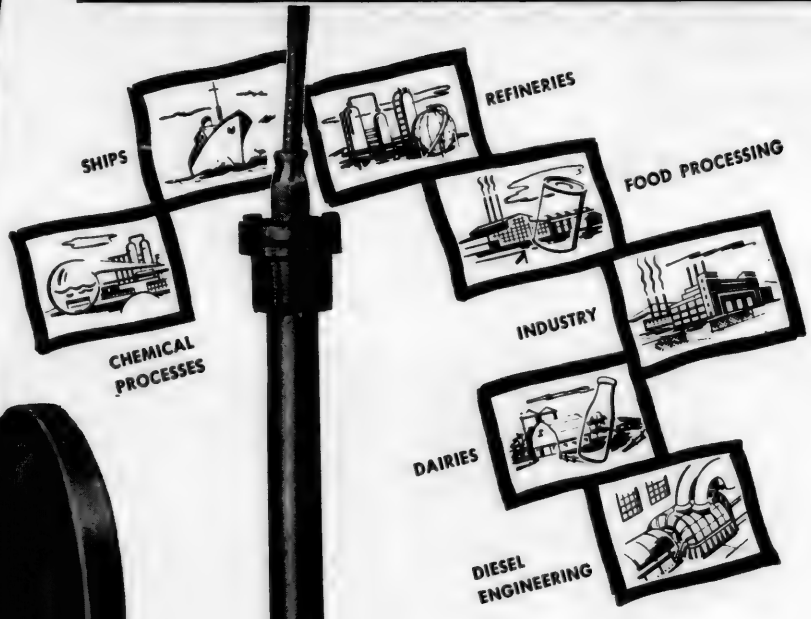
POWERS CONTROL

Unique Indoor-Outdoor Pool—was built by the City of Wyandotte adjacent to the Lincoln School. Both share its cost and year 'round use, resulting in big savings. Note the large sliding glass doors opening in summer to outdoor sundeck. Heating and ventilating and pool water temperatures are thermostatically regulated by a POWERS CONTROL SYSTEM.

Where PRECISION PERFORMANCE Counts!...

. . . AND ABSOLUTE ACCURACY IS A NECESSITY . . . Look to the Lawler Type "S" Temperature Regulator to fulfill the requirements. Instant response, "hair-line" control with rugged longer-lasting performance make the Type "S" the best temperature regulator available.

Hydraulically formed, non-ferrous bellows type thermostat guarantees instant correcting action in response to the smallest change from desired temperature setting. Highly polished stainless steel stem provides friction-resistant operation . . . rugged durability for a life-time of accurate control. Smaller temperature spread of the Type "S" allows for more accurate control putting the valve into action as soon as the temperature goes off a single degree. No job is too tough . . . no application too unique for the Type "S" Temperature Regulator.



LAWLER TYPE "S" TEMPERATURE REGULATOR

DIRECT ACTING — Accurately controls all steam heating equipment. Protects against over heating . . . a rise in temperature above setting closes valve.

REVERSE ACTING — For cooling systems and recirculating lines. Rising temperature opens valve . . . drop in temperature causes valve to close.

THREE WAY — Mixes hot and cold liquids . . . delivers them at a constant pre-determined temperature.

THE Lawler Line of

PERFORMANCE TESTED FOR LONGER LIFE

Steam Temperature Regulators
Thermostatic Shower Mixing Valves
Water Controllers
Tempering Valves

DESIGNERS AND PRODUCERS OF THERMOSTATICALLY OPERATED VALVES SINCE 1895

Thermostatic Control Valves

LAWLER AUTOMATIC CONTROLS, INC., MT. VERNON, N. Y.

Sarco Condensate and Vacuum Pumps give you this big advantage...

UNDIVIDED RESPONSIBILITY
by Sarco for pumps as well as heating specialties!

Now Sarco expands its extensive heating line... by adding *condensate and vacuum pumps*... offering you in still larger measure the protection and convenience of *undivided responsibility*.

Shown above is one of the many Sarco pumps... it's the streamlined Sarco type S condensate pump. Designed and built to Sarco's traditionally high quality standards, it assures you top performance and long, trouble-free life. The many advantages include:

...Low 7½" inlet... Close coupling... No sub-base needed. Inspection? Just unscrew 3 nuts and lift the motor; no need to disconnect the piping. For a complete list of features, mail the coupon today.

Selection—The experienced Sarco-Sarcotherm engineering staff will gladly help you select the right Sarco condensate or vacuum pump for each job.

Undivided Responsibility—From *one* reliable "Complete Line" source... SARCO-SARCOTHERM ...get not only condensate and vacuum pumps but also heating specialties, steam traps, temperature regulators, finned-tube radiation, and weather-compensated control systems for steam and hot water heating.

SARCO—SARCOTHERM

MAIL COUPON FOR THESE BULLETINS

Sarco Company, Inc.
Sarcotherm Controls, Inc.
Empire State Bldg., New York 1, N. Y.

Please send me:

☐ Bulletin on New Sarco type S Condensate Pumps.

☐ Bulletin on all Sarco Vacuum and Condensate Pumps.

Name_____
Firm_____
Address_____
City_____ State_____

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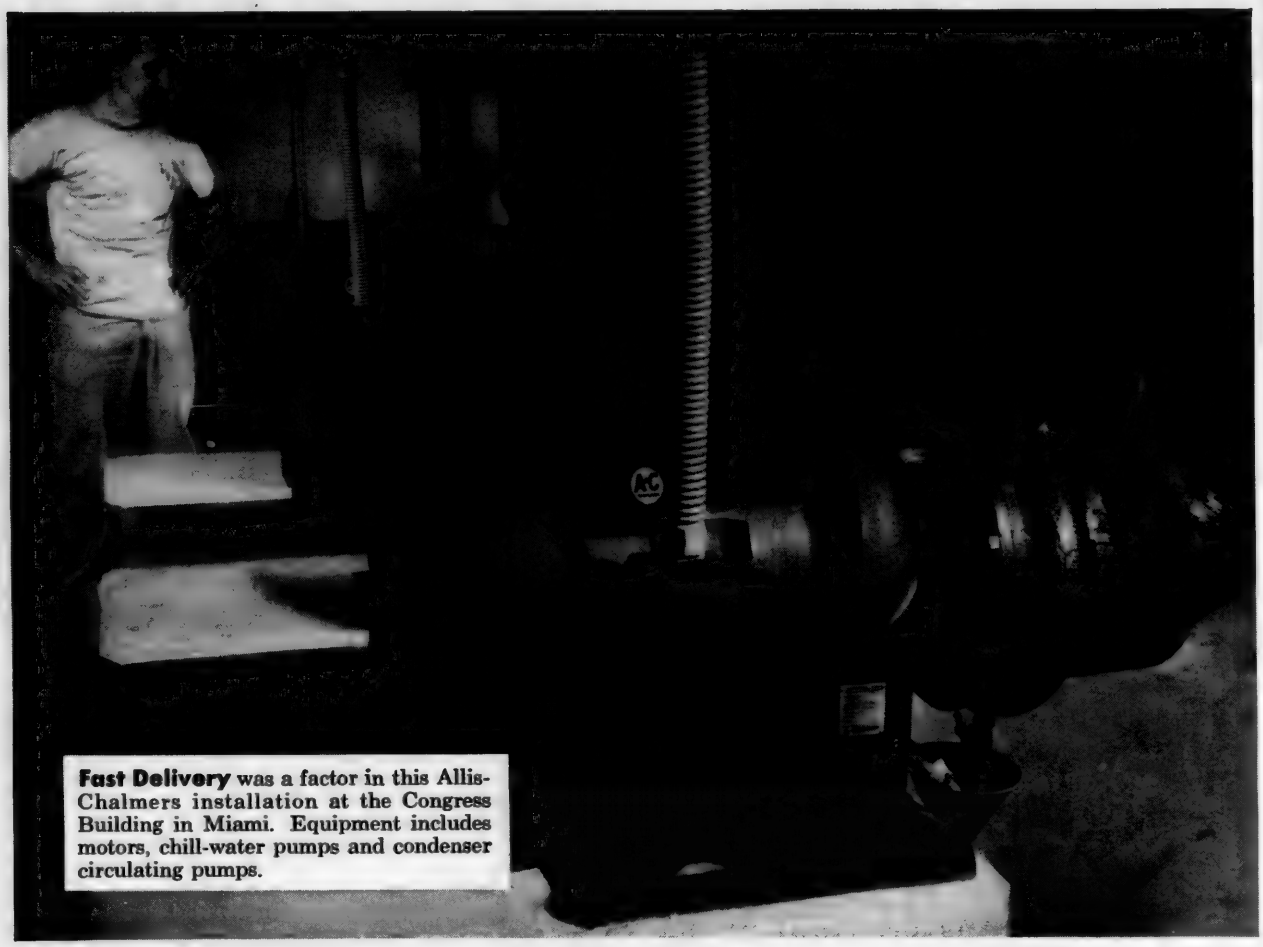


Fast Delivery was a factor in this Allis-Chalmers installation at the Congress Building in Miami. Equipment includes motors, chill-water pumps and condenser circulating pumps.

For quick delivery on motors and pumps

Specify Allis-Chalmers

WHEN you specify equipment for air conditioning installations, you want *dependability* and delivery *when you need it*. Allis-Chalmers guarantees you both with its complete line of motors and pumps.

Local Stock

A national network of authorized distributors, plus strategically located warehouse stocks, assures you *prompt* delivery of the right equipment for your job. Whatever your location, Allis-Chalmers makes sure that your installation won't be slowed down by poor delivery or "broken shipping promises".

More Dependable Cooling

Once you install Allis-Chalmers, your system has equipment known for its ability to keep going season after season. Unit responsibility means A-C pumps and motors are engineered to work together. Your customers are assured of staying cool and you slash service call-backs.

Along with Motors and Pumps, A-C supplies control and V-belt drives. You can obtain the name of your distributor by contacting your nearby Allis-Chalmers sales office, or write Allis-Chalmers, General Products Division,
Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

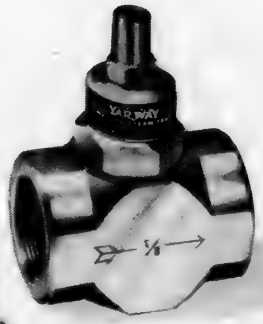
A-C ALLIS-CHALMERS

A-5188

½" No. 60 or 120

¾" No. 61 or 121

1" No. 63 or 123



1½" No. 66 or 126

1¼" No. 64 or 124

2" No. 67 or 127

all of these steam traps are impulse!

Take your choice! There is a Yarway Impulse Steam Trap for practically every trapping requirement in your plant.

Revolutionary when introduced 20 years ago, the *Yarway Impulse* principle has been proved by more than a million in service everywhere, is still gaining new friends every day.

SERIES 60—for *normal steam trap requirements;* pressures to 400 psi, temperatures to 450° F. Stainless steel body and working parts. Six sizes, ½" to 2".

NO. 20-A—available in ½" size only— similar to ½" #60, but with low capacity—designed especially for *light condensate loads.*

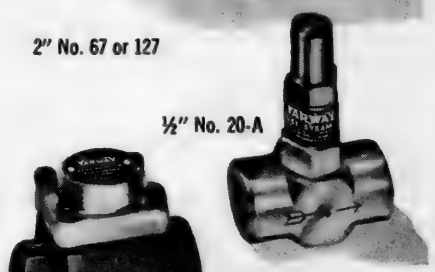
SERIES 120—same as Series 60 but for higher pressures and temperatures (600 psi, 750° F). Featuring all-stainless steel construction. Six sizes, ½" to 2".

SERIES 40—for *heavy condensate loads* requiring high capacity traps. Sizes ½" to ¾" in stock, larger sizes (1½", 2", 2½") available.

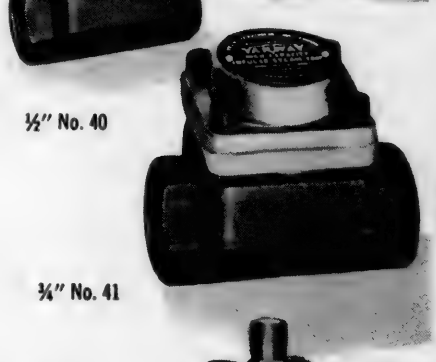
INTEGRAL STRAINER TRAPS—for marine use and for high pressure trapping service in steam power plants with pressures up to 2500 psi. Six sizes, ½" to 2"; flanged and socket-welding ends.

All Yarway Impulse Steam Traps are available through 270 convenient local Industrial Distributors. For descriptive bulletin on any type of Impulse Trap, write . . .

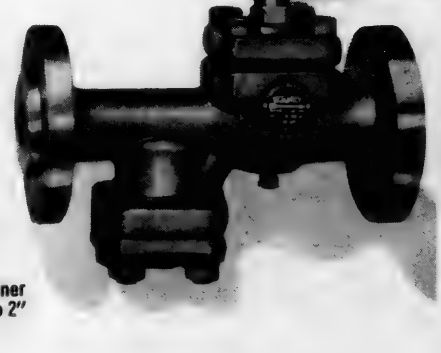
YARNALL-WARING COMPANY
104 Mermaid Avenue, Philadelphia 18, Pa.



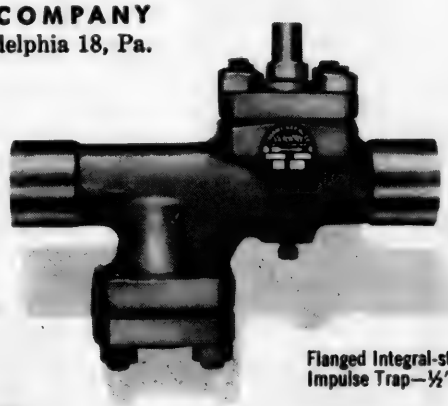
½" No. 20-A



½" No. 40



¾" No. 41



Socket-weld Integral-strainer Impulse Trap—½" to 2"

Flanged Integral-strainer Impulse Trap—½" to 2"

YARWAY IMPULSE STEAM TRAPS

The Impulse that revolutionized steam trapping 20 years ago

Office Building

THE NEW ENGLAND LIFE BUILDING, Boston, Massachusetts. Architects: Cram & Ferguson; Engineers: Buerkel & Company. ELECTRO-MATIC filters supply 200,000 cfm of super-clean air on nine air conditioning systems.

Saves $16,000 a Year

with *Electro*-MATIC filters!

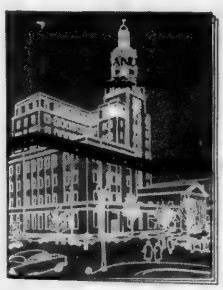
New England Life Building gets SUPER-CLEAN Air at a saving

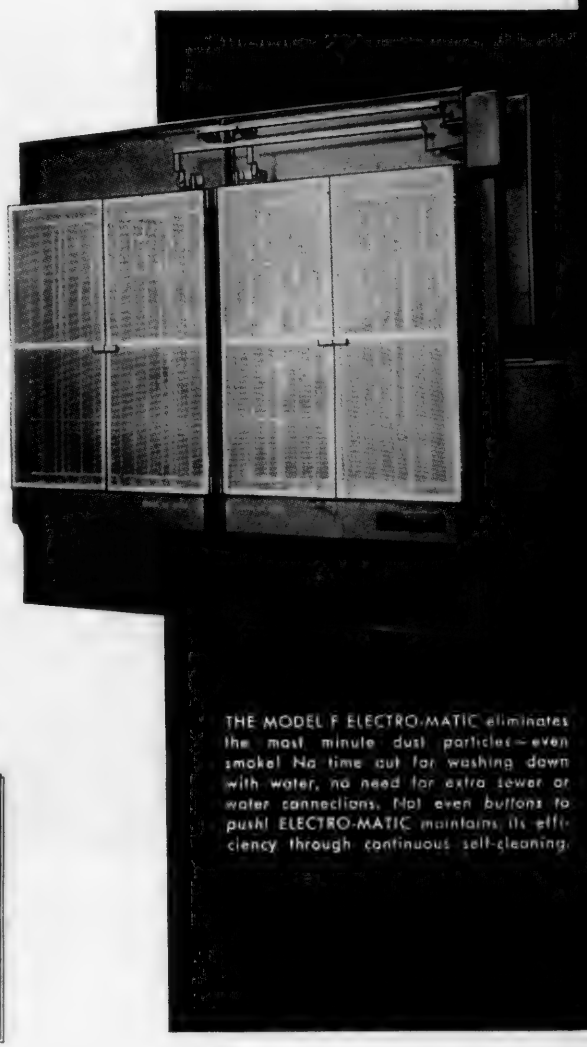
IN 1941, when the New England Life Insurance Company moved into its beautiful new building, *mechanical* filters were installed to supply 200,000 cfm of clean air for nine air conditioning systems.

Six years later, these filters were replaced with AAF ELECTRO-MATICS. Results: *super-clean* air allowed a *20% reduction* in the cleaning staff. The ELECTRO-MATICS have long since paid for themselves and are now saving the Company $16,000 *every year* they are in operation!

And maintenance is remarkably simple. One man spends *less than 8 hours a week* maintaining filters on all nine systems. That's because ELECTRO-MATIC has its own built-in "maintenance crew"—cleans *itself* continually, *while it's cleaning the air!*

Super-clean air at a saving—that's "the New England Life ELECTRO-MATIC Story" in a nutshell. *Now*—get the *whole* story. Write for free 12-page booklet that provides complete data on ELECTRO-MATIC's money-saving performance.





THE MODEL F ELECTRO-MATIC eliminates the most minute dust particles—even smoke! No time out for washing down with water, no need for extra sewer or water connections. Not even buttons to push! ELECTRO-MATIC maintains its efficiency through continuous self-cleaning.

AAF

herman nelson

American Air Filter
COMPANY, INC.
294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

AAF Dust Control Equipment

Illinois Steam Heating Specialti

BETTER AIR IS OUR BUSINESS

Herman Nelson Unit Heaters

Herman Ne Unit Ventila

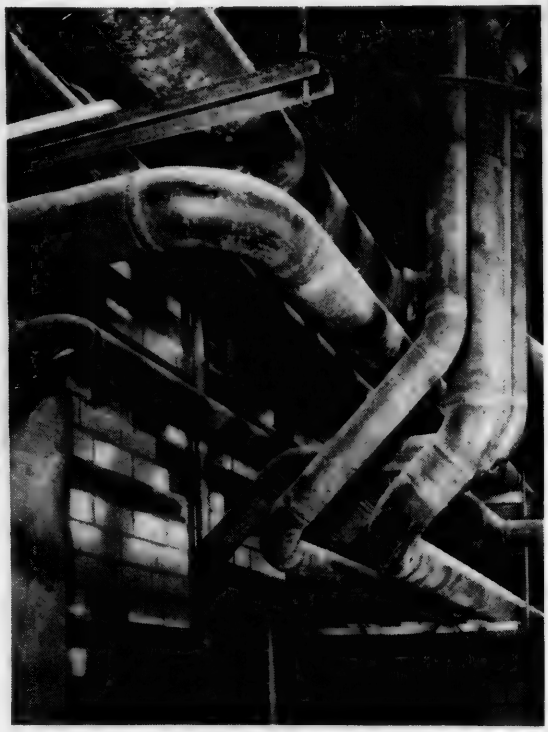
NATIONAL SEAMLESS PIPE

used for heating and air conditioning system of new Texas National Bank Building

USS National Seamless Pipe, in sizes from 4" O.D. to 16" O.D., was utilized in the heating and air conditioning system of this new Houston, Texas, building, owned jointly by Texas National Bank and Continental Oil Co., as follows:

Sizes 4", 6", 8", 10" and 12" are used for combination hot and chill water lines to the primary and zone conditioners as well as the perimeter units. The 16" O.D. pipe is used for handling condenser water.

The 14" O.D. pipe is part of the steam piping system which in turn converts the water into hot water for heating through the use of converters.



USS National Seamless Pipe is consistently the number one choice of engineers and contractors throughout the country for air conditioning, heating and power installations. Its ability to render efficient, trouble-free service under all types of pressure and temperature conditions has given National Seamless a reputation for safety and dependability excelled by no other pipe. For further information, or assistance with your pipe problems, get in touch with our engineers.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

NATIONAL Seamless PIPE AND TUBES

WALLS WITHOUT WELDS

UNITED STATES STEEL

Horne's main store in Pittsburgh has 28 filter stations with banks ranging from 10 to 48 filters each. Pittsburgh Glasfloss Filters are used exclusively. The system was installed in 1937.

Howard F. Burrell, Chief Engineer, reports that Pittsburgh Glasfloss Filters are easy to handle, soft and light weight; and that this Fiber Glass filter does not splinter or shred.

"We effected a direct unit saving of 13% by switching to Pittsburgh Glasfloss Air Filters"

—says Howard F. Burrell, Chief Engineer JOSEPH HORNE CO., Pittsburgh, Pa.

"The filters we previously used in our store-wide air conditioning system would shred and stick to fingers and clothing when handled," reports Mr. Burrell. "They were not uniform in quality and their performance was erratic.

"We switched to Pittsburgh Glasfloss Filters in February, 1956. We found Glasfloss Filters much easier to handle. They are lighter in weight and safer, too; this Fiber Glass does not splinter or shred. What's more, Glasfloss lasts longer, making it possible for us to effect a 13% saving over filters previously used.

"From an engineering point of view, we consider Glasfloss the most practical, economical and dependable filter possible to obtain for our system!"

Glasfloss Filters Will Give You Best Results, Too!

Pittsburgh Glasfloss Filters are made of fine, soft Fiber Glass, which provides greater dust-collecting areas without interfering with the air flow. They are moisture proof and fire resistant. Glasfloss Filters will give you top service from your air conditioning system, help you cut costs.

Contact your nearest Glasfloss Distributor or Pittsburgh Plate Glass Warehouse. *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

PITTSBURGH GLASFLOSS FILTERS ARE A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

FIBER PG GLASS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

Sound-sealed, compact. Interior view shows full utilization of space which makes TRANE unit so trim. Note, too, how refrigeration equipment is virtually sealed away in its own independent compartment.

TRANE 10 and 15-ton deluxe air conditioners. Note dual refrigeration cycle using hermetic compressors.

Larger sizes, too. 10, 15 and 20-ton models with or without evaporative condensers. Delivered with all internal wiring and piping completed. As their heart, they have TRANE Reciprocating Compressors, famed for long life, easy servicing, with complete interchangeability of parts.

THE TRANE COMPANY, LA CROSSE, WIS. • EASTERN MFG. DIV., SCRANTON, PA.
TRANE COMPANY OF CANADA, LTD., TORONTO • 90 U.S. AND 10 CANADIAN OFFICES

So quiet you

Modern "Iso-Sound" design

Even if you're seated as near a TRANE Self-Contained Air Conditioner as the people in this picture—*you can't hear the compressor cut in!*

It's because TRANE has completely redesigned the usually noisy elements of packaged air conditioners to bring you whisper-quiet operation.

In the mechanical refrigeration section, specially designed parts reduce vibration, minimize noise.

Centrifugal fans are twice tested for quietness. Fan housings are *tight* to prevent noisy air leaks.

With new TRANE "Iso-Sound" design, both fan and compressor sections float independently on sound and vibration isolators.

can't hear it start !

compressor plus exclusive Trane assures smooth, vibration-free operation!

The result: the smoothest, quietest package unit in TRANE history. One you can confidently specify for clients who want *quiet* as well as *comfort*. And trim, slim beauty in cabinet design, too!

TRANE Self-Contained Air Conditioners are bringing *big system* performance to stores, shops and offices and factories all over the nation.

The complete TRANE line includes package units from 3 to 20 tons—other equipment to 1,500 tons—to handle any size or type of job.

For full data on the TRANE packaged line for 1957, call your nearby TRANE Sales Office or write TRANE, La Crosse, Wisconsin.

For <u>any</u> air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF HEATING, COOLING, VENTILATING AND HEAT TRANSFER EQUIPMENT

Your Pipeline to Progress
Starts at the
13th INTERNATIONAL HEATING & AIR-CONDITIONING EXPOSITION

(formerly the International Heating & Ventilating Exposition)

INTERNATIONAL AMPHITHEATRE—CHICAGO
FEBRUARY 25—MARCH 1

Under the auspices of the American Society of Heating and Air-Conditioning Engineers, and in conjunction with their 63rd annual meeting.

At the largest exposition of its type in the world—with nearly 500 exhibitors—you'll see first-hand thousands of new and improved products—all on one floor—easy for you to learn and compare the relative merits. New industrial applications of air conditioning, heating and ventilating systems that will widen the scope of your business. New types of heat exchangers, heat pumps and other products that will profit the commercial user. And new domestic equipment of interest to all contractors, architects and builders.

Your pipeline to progress and profits starts at Chicago on February 25th. Be sure to be there. Write now for advance registration to:

13TH INTERNATIONAL HEATING AND AIR-CONDITIONING EXPOSITION

480 Lexington Ave., New York 17, N. Y.

MANAGEMENT: INTERNATIONAL EXPOSITION COMPANY

13TH INTERNATIONAL HEATING AND AIR-CONDITIONING EXPOSITION

480 Lexington Avenue, New York 17, N. Y.

Please register the following in advance and forward identification badges:

NAME_____ TITLE_____

NAME_____ TITLE_____

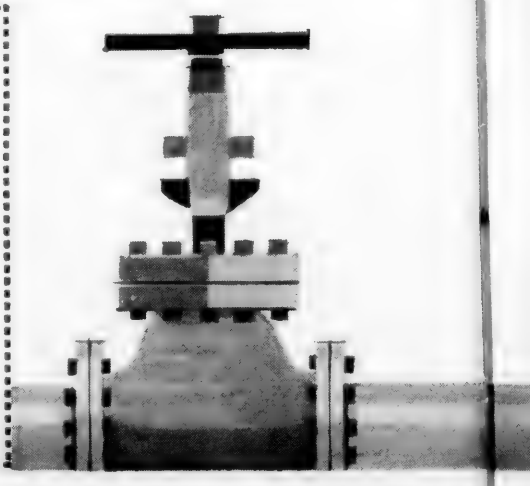
NAME_____ TITLE_____

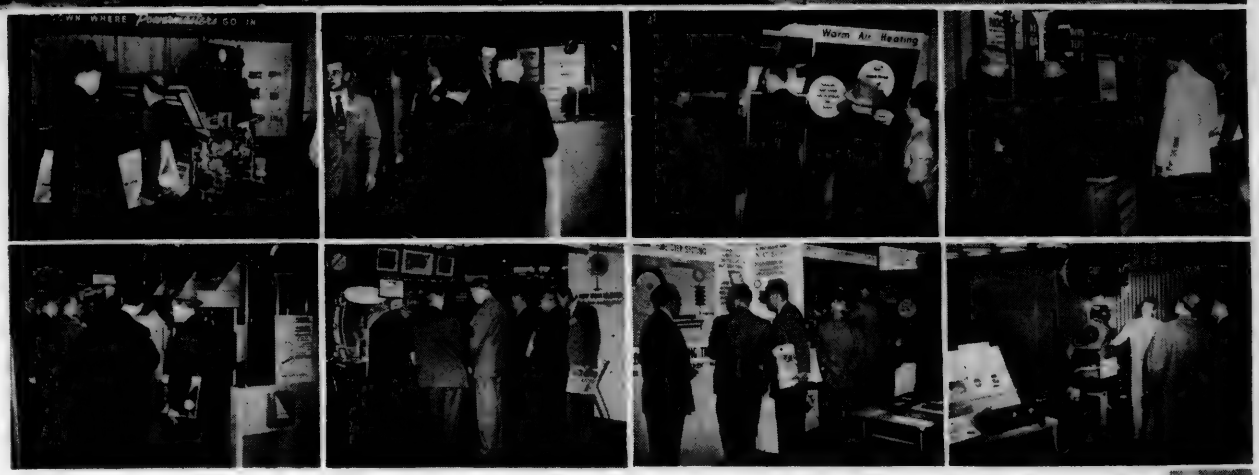
COMPANY NAME_____

COMPANY ADDRESS_____

CITY_____ ZONE_____ STATE_____

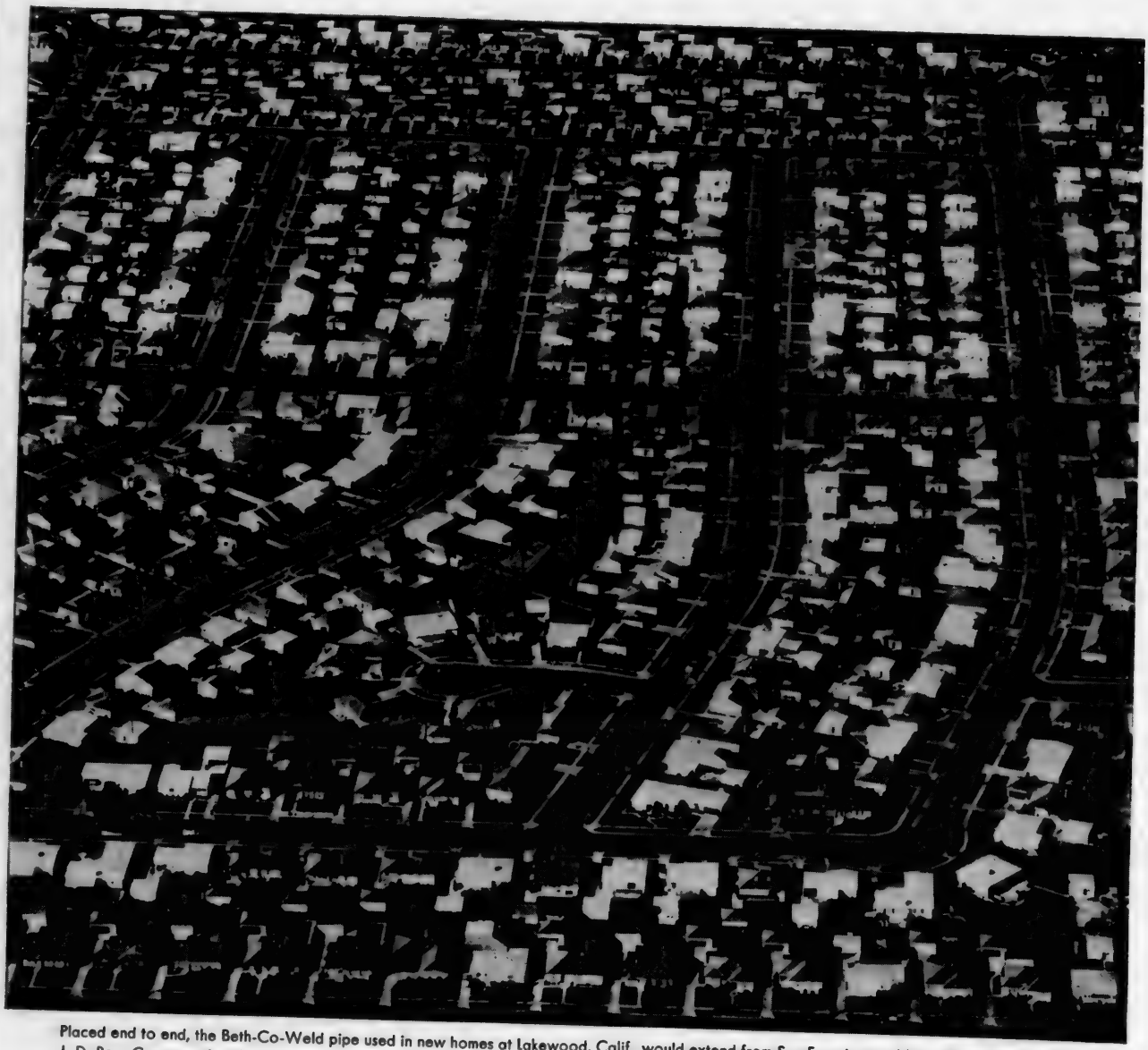
COMPANY'S BUSINESS, SERVICE OR PRODUCT_____





HERE ARE JUST A FEW OF THE MANY TYPES OF NEW PRODUCTS YOU WILL SEE DEMONSTRATED

Aftercoolers
Air Conditioning Equipment
Air Diffusers
Air Velocity Regulators
Anemometers
Baseboard Radiation
Blowers
Boilers
Burners
Circulators
Coils
Compressors
Condensers
Controllers
Controls
Convection Heaters
Cooling Towers
Cut-offs, Low Water
Damper Regulators
Dehumidifiers
Dust Collecting Equip.
Electric Heaters
Ducts & Fittings
Evaporators
Fan Blades
Fans
Filters
Flue Gas Analysers
Fuels
Furnaces
Gas Burners
Governors
Grilles
Hangers
Heat Exchangers
Heat Surface
Heating Systems
Heat Pumps
Humidifiers
Hygrometers
Ignition Systems
Insulation
Liquid Level Controls
Louvers
Manometers
Metals
Meters
Motors
Nozzles
Oil Burners
Panel Heating
Pipe Cutting & Threading Machines
Pipe Wrenches
Pyrometers
Radiators
Refractories
Refrigerants
Refrigeration Controls
Refrigerating Machinery
Relays
Separators
Sheet Metal Equipment
Smoke Detectors
Steam Traps
Stokers
Strainers
Thermostats
Transformers
Transmission Equipment
Turbines
Valves
Ventilators
Vibration Absorbers
Weather Instruments



Placed end to end, the Beth-Co-Weld pipe used in new homes at Lakewood, Calif., would extend from San Francisco to Miami. Pipe Contractors: J. D. Ross Company, Los Angeles, and Hartshorn Brothers Plumbing Co., Bellflower. Pipe Jobber: Familian Pipe & Supply Co., Inc., Los Angeles.

3,200 Miles of Beth-Co-Weld In New Homes at Lakewood, Calif.

The growth of Lakewood, Calif., has been phenomenal — from a population of 15,000 in 1949 to about 90,000 today. In the years 1950-1954 alone, some 31,000 attractive residences were constructed at Lakewood. In the piping layouts for these homes a total of 3,200 miles of Beth-Co-Weld steel pipe was used.

Beth-Co-Weld is an excellent plumbing and heating pipe, not only for the home-building field, but for industrial installations as well. Beth-Co-Weld saves time because it's easy to cut and thread. It has a sound weld, too, because it's made by the continuous-weld process from a good grade of carbon steel.

Most pipe jobbers furnish Beth-Co-Weld in these size ranges in 21-ft lengths, plus or minus 1 in., and in random lengths:

Standard, ½ in. to 4 in.

Extra Strong, ½ in. to 3 in.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corp. *Export Distributor:* Bethlehem Steel Export Corp.

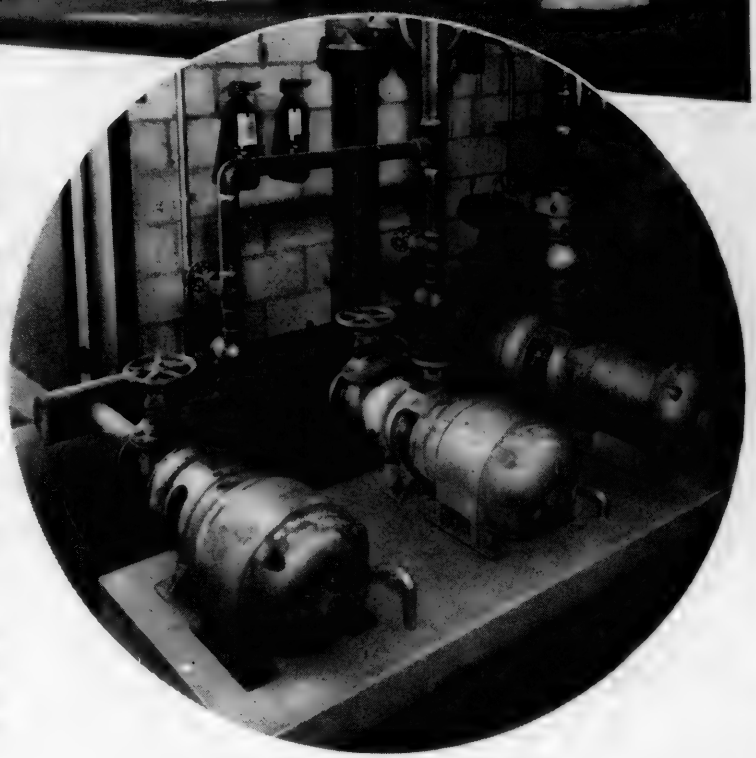
BETHLEHEM STEEL

BETHLEHEM STEEL

another new supermarket

another IR MOTOR PUMP installation...

Dependable and economical Ingersoll-Rand Motorpumps help assure operation of the New Supermarket's 100 ton air conditioning system.



Air conditioning architects, engineers and contractors who know the importance of customer satisfaction, are depending more and more on Ingersoll-Rand Motorpumps for care-free, trouble-free service.

Advanced features and rugged construction of I-R Motorpumps for air conditioning have meant an end to costly breakdowns. Low-cost operation and ease of installation make them the natural choice for air conditioning systems.

For additional information contact your nearby Ingersoll-Rand representative or write for data to Ingersoll-Rand Cameron Pump Div., 11 Broadway, New York 4, N. Y.

Features like these set the pace with years-ahead performance:

- **Compact, space-saving**
- **Operate in any position**
- **Simple installation**
- **Sizes up to 75 hp**

Ingersoll-Rand IR

9-419 Cameron Pump Division
11 Broadway, New York 4, N. Y.

PUMPS • COMPRESORS • TURBO-BLOWERS • VACUUM EQUIPMENT • ROCK DRILLS
AIR & ELECTRIC TOOLS • GAS & DIESEL ENGINES

Harley Ellington & Day — Architects & Engineers

CITY-COUNTY BUILDING IN DETROIT INSTALLS 3,600 BUENSOD-STACEY DUAL DUCT AIR MIXING UNITS

Here's why

The pioneer work done by Buensod-Stacey made the Buensod Air Mixing Units the only ones suitable for an installation of this magnitude. Here are the advantages they offer –

The engineers found them efficient. They are the only dual duct mixing units with a self-contained, completely automatic volume control. This control maintains the desired supply of conditioned air regardless of variations in pressure at the inlet.

The contractors found them practical. The automatic volume control, when once set, does not need rechecking. Adjust one nut and the unit delivers the required air volume.

The architects found them flexible. They allow each individual room to maintain its own separate temperature. You can heat one room and cool the one next to it.

The owners found them economical. One system conditions the entire building – needs no seasonal changeover. There is no local air recirculation – therefore no need for individual circulating fans. There is no need for a separate heating system.

The occupants find the result — totally comfortable. The Dual Duct system provides completely filtered air, at any desired temperature, at all hours of all seasons. The mixing units are *quiet* – they are acoustically treated to eliminate noise. They are not drafty, but diffuse air evenly, steadily throughout the room.

Buensod Dual Duct Mixing Units are useable in large or small, existing or new buildings. Application data available for consulting engineers and contractors.

BUENSOD-STACEY
INCORPORATED

Buensod-Stacey, Inc. 45 West 18th Street New York 11, N. Y.
Charlotte, North Carolina Richmond, Virginia

QUALITY

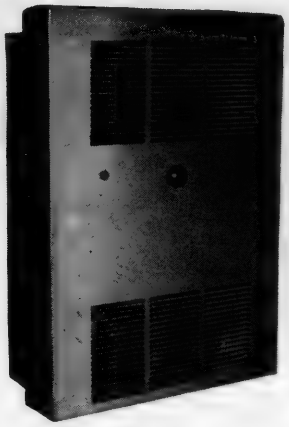
has no substitute

Use **KRITZER**

heating and cooling

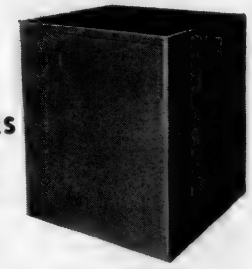
equipment for profit

and top performance



DUAL-VECTOR®

Low cost, combination heating and cooling units for residences, apartments and motels. Two models fit between studding. Easy installation. Clean, filtered air both summer and winter. Insulated enclosures prevent condensation. Individual room control optional. Free-standing types for remodeling.

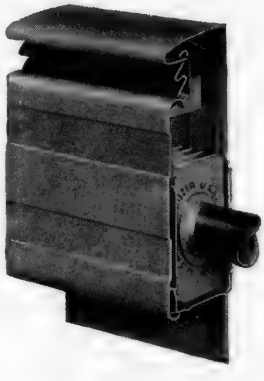


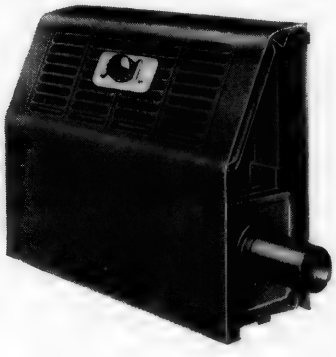
HYDRO-PAC® WATER CHILLERS

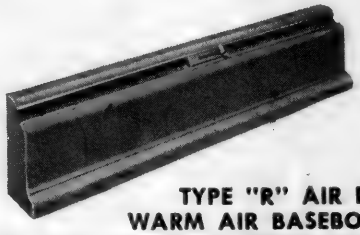
Completely packaged. Factory tested. Ready for easy field installation. Fine "furniture" steel cabinets with baked enamel finish. Five year warranty on hermetic system.

UNIT HEATERS Horizontal and vertical discharge, propeller fan types. Wide selection of sizes for steam and hot water. Die formed cabinets of heavy gauge steel. Baked-on, gray hammer enamel finish. Rubber mounted motors. Dynamically balanced fans in deep drawn venturi for quiet operation.

CONVECTOR-RADIATORS Floor, wall hung and recessed models. Famous KRITZER coil construction for steam and hot water. Bronze headers. Heavy, reinforced steel cabinets. Full range of sizes. Chain or knob operated dampers. Cabinets phosphatized. Gray prime, baked-on finish.







TYPE "R" AIR BASE WARM AIR BASEBOARD

Adds beauty to any home. Efficient warm air heating or cooling. Two and four foot lengths. Built to last.

"K" LINE RADIANT BASEBOARD

Clean, modern lines. Quiet. Easy to install. For homes, apartments, offices.

STB RADIANT BASEBOARD

For hard-to-heat areas. Large heating capacity... Safe, rounded corners and edges.

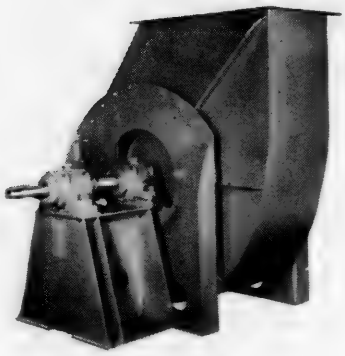
ASK YOUR JOBBER FOR KRITZER PRODUCTS

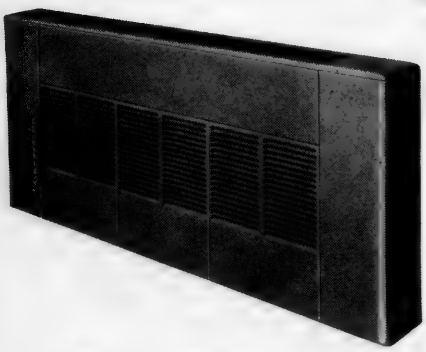
"IF IT'S KRITZER, IT'S RIGHT, SIR!"

KRITZER RADIANT COILS, INC.
2901 Lawrence Ave. • Chicago 25

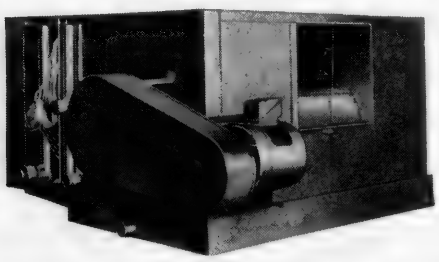
KRITZER

Sirocco® High-Pressure Fans are part of the complete American Blower package for high-velocity, high-pressure air-handling systems.

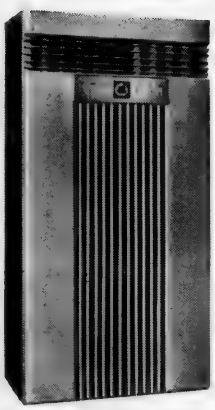




Planning a peripheral system? Compact American Blower Inductor Units can be mounted vertically or horizontally.

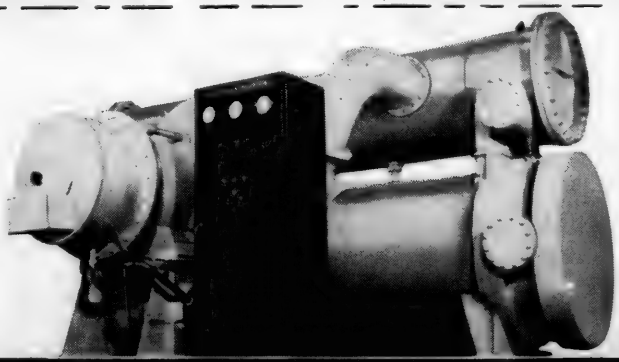


American Blower Type A Conditioners provide control of summer cooling and winter heating for central-station air-conditioning systems.



American Blower Packaged Air Conditioners are self-contained units that cool, filter, dehumidify, circulate. For stores, showrooms, factories. Sizes 3 to 20 tons.

Planning a central-station system? American Blower Tonrac® Centrifugal Refrigerating Machines maintain constant chilled-water temperature regardless of load. One-level construction saves weight, space, installation costs.



®TRADEMARK

Here's how you benefit when you select all your air-conditioning components from American Blower's complete line:

American Blower cooling, heating, air-handling and air-conditioning products are designed, engineered, manufactured to work together!

When choosing air-conditioning equipment — for a large-scale central or zone system, or a system for a smaller store, showroom or industrial plant — it pays to select from one source. A single source pinpoints responsibility for quality, performance, delivery dates . . . saves time and money.

Complete line fits all requirements

The components shown opposite are only a few of the complete line of American Blower quality air-conditioning products, designed, engineered and manufactured to work together. Refrigerating machines, heating and cooling coils, central-station air-conditioning units, multi-zone conditioners, inductor units, sprayed-coil dehumidifiers, self-contained air conditioners, heavy-duty fans, equipment for heating, cooling, dehumidifying . . . whatever your needs, specify American Blower for undivided responsibility!

Expert service before, during and after the sale

The more than 300 skilled American Blower factory and sales engineers in all parts of the country are at your service. Each has the know-how and experience to help you select and apply the exact American Blower equipment you need. And what's more, they'll follow-through during and after the installation to ensure your satisfaction.

Performance-proved by 75 years' experience

American Blower's 75 years' experience as a leading producer of air-conditioning, air-handling, cooling and heating products is your guarantee of a successful installation every time, and your client's assurance of years of trouble-free air conditioning. American Blower products have proved dependable in thousands of important installations in all parts of the world.

Get in touch with our nearest branch office for full information, or write: American Blower Division of American-Standard, Detroit 32, Mich. In Canada, look for Canadian Sirocco products.

See our exhibit, Booths 22 and 26, at the 13th International Heating and Air Conditioning Exposition, International Amphitheater, Chicago, Illinois, February 25 through March 1, 1957.

AMERICAN BLOWER

Division of AMERICAN-Standard

AIR-CONDITIONING EQUIPMENT FOR EVERY BUSINESS

WE'RE Mighty Proud

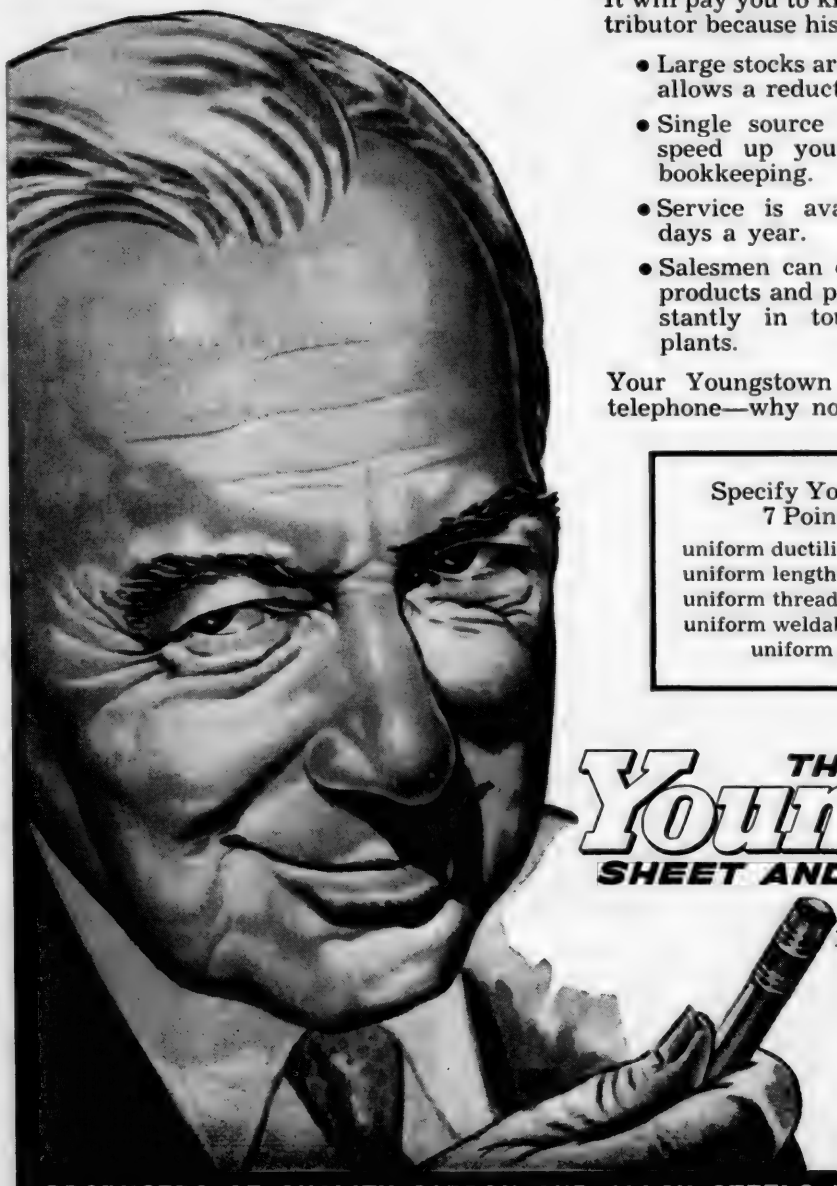
OF YOUNGSTOWN'S DISTRIBUTORS

Youngstown Distributors are in business for only one reason—to quickly supply what you want, when you want it, and in the quantity you require. They provide you the highest quality Youngstown Pipe at the right price—by coordinating their distribution with our mill production. Yes, our hat's really off to these valuable around-the-clock suppliers for the important function they daily perform to industry.

It will pay you to know and use your Youngstown Distributor because his:

- Large stocks are immediately available which allows a reduction in your inventory.
- Single source of supply will simplify and speed up your purchasing, receiving and bookkeeping.
- Service is available around-the-clock, 365 days a year.
- Salesmen can offer valuable information on products and processes because they are constantly in touch with leading industrial plants.

Your Youngstown Distributor is as near as your telephone—why not call him today?



Specify Youngstown and secure these 7 Points of uniform goodness

uniform ductility
uniform lengths
uniform threading
uniform weldability
uniform wall thickness and size
uniform strength and toughness
uniform roundness and straightness

THE Youngstown SHEET AND TUBE COMPANY

General Offices - Youngstown 1, Ohio
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QUALITY YOUNGSTOWN SERVICE

YOUNGSTOWN PIPE

PRODUCERS OF QUALITY CARBON AND ALLOY STEELS FOR OVER HALF-A-CENTURY

WAGNER ELECTRIC MOTORS THE CHOICE OF LEADERS IN INDUSTRY

smaller, lighter fractional horsepower motor solves problems for the design engineer

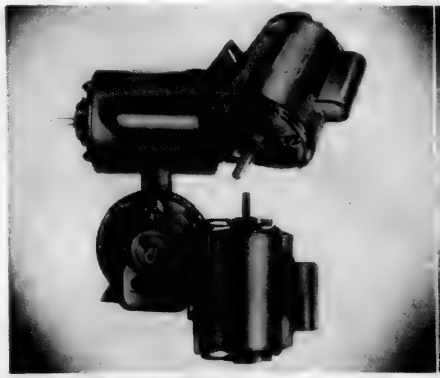
Type RK, Capacitor-start, ⅛, or ¼ hp.

the WAGNER "48"

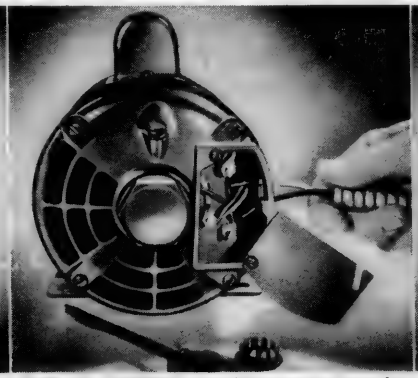
Here's the 48 frame motor you've been looking for! The Wagner "48" capacitor-start motor with either resilient or welded rigid base. You get the standard 48 frame size, with from *three to eight pounds less weight per motor* than previous models of the same hp ratings!

The Wagner "48" is rugged enough to permit direct mounting, compact enough to fit in tight spots, will operate efficiently when mounted at any angle. Through ventilation assures cool operation that adds to motor life.

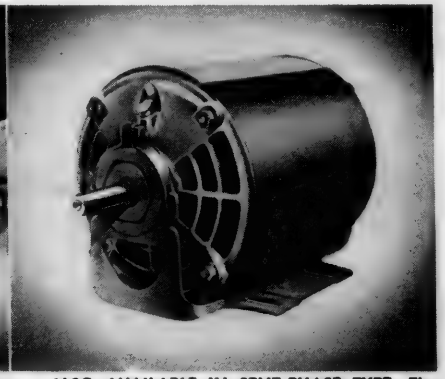
If you would like to test the Wagner "48", one of our field engineers will be glad to furnish a sample motor. Contact the Wagner Branch near you or write to the factory.



ALL ANGLE OPERATION. You can mount the Wagner "48" at any angle. A new lubrication system assures positive protective lubrication in any position.



EASY TO CONNECT. Just loosen one screw for access to terminal board. EASY TO SERVICE . . . no need to disconnect leads when removing endplates.



ALSO AVAILABLE IN SPLIT-PHASE TYPE. The Wagner "48" is also furnished in split-phase type, with resilient or rigid base in ratings of ⅛, ¼ and ⅓ hp.

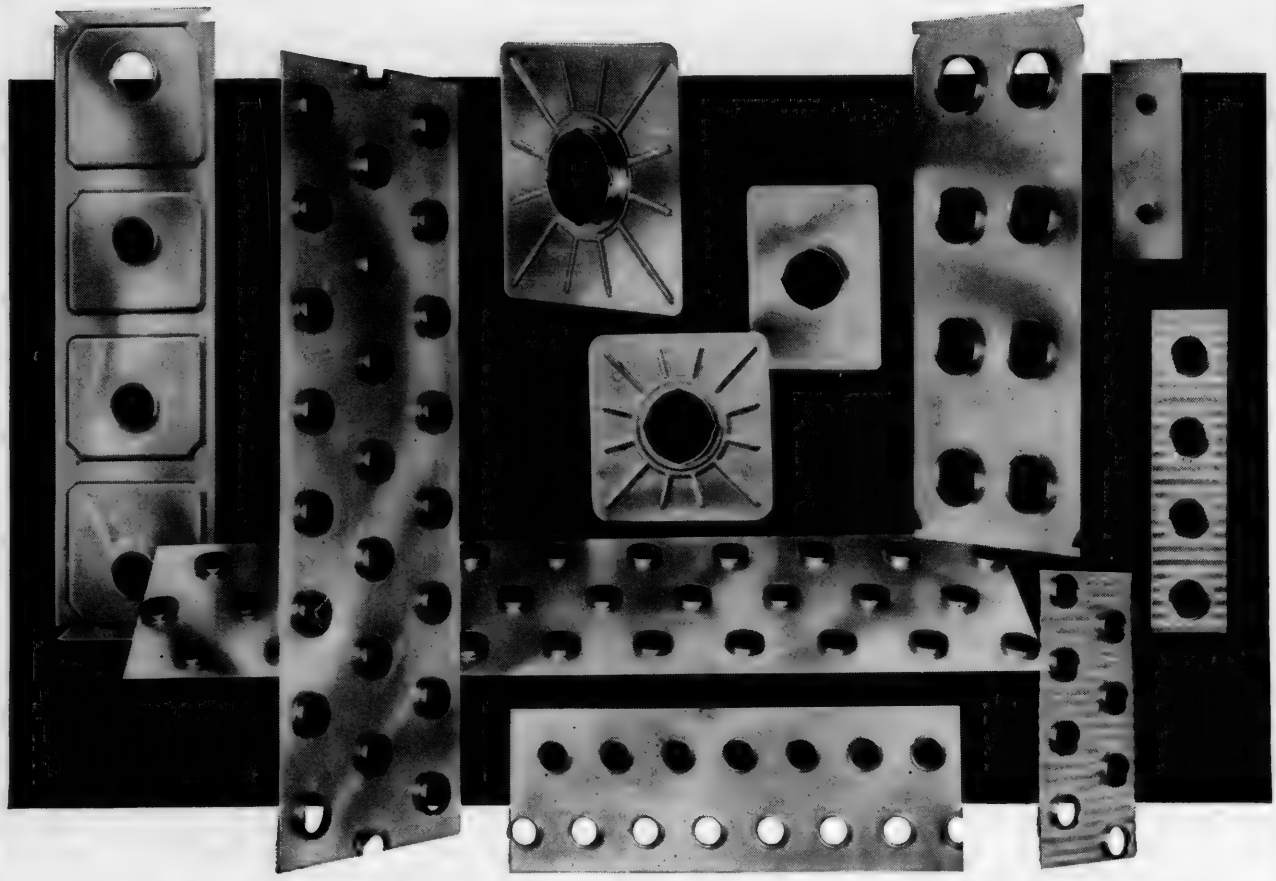
Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.

H57-2

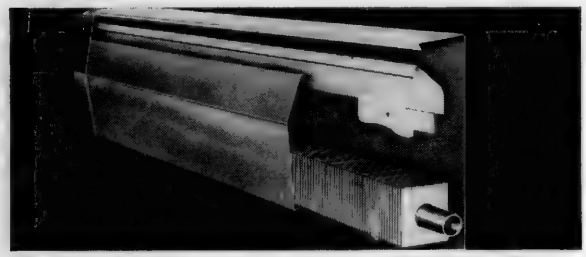
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC



YOU GET MAXIMUM DESIGN LATITUDE WITH

FAIRMONT ALUMINUM

For perfection in the formation of fin collars, to assure excellent mechanical and thermal bonding to tubing, ***EMBASSY*** uses wrought aluminum 1100 alloy, .010″ thick, made by Fairmont.



Baseboard heater section made by ***EMBASSY STEEL PRODUCTS, INC.***, Brooklyn 8, New York, employs 60 die-formed fins per foot made of Fairmont aluminum.

To meet widely differing specifications in the manufacture of heat-transfer surfaces such factors as size, shape, thickness, perforation and spacing of fins are given proper evaluation by design engineers. Of equal importance is the aluminum fin's ability to withstand rapid mechanical forming in production and assembly without developing cracks or buckling, its ability in service to withstand temperature, moisture and mechanical attacks.

With an enviable reputation for rigid quality control and specialized attention to manufacturers' requirements for uniform wrought aluminum alloy 1100 and 3003 sheets and coils, Fairmont enjoys the continuing preference of foremost heat-transfer surface manufacturers. Write or call today for details.

Sales offices in principal cities

FAIRMONT ALUMINUM COMPANY

SUBSIDIARY OF **CERRO DE PASCO CORPORATION**

Dept. AC-1 • FAIRMONT, WEST VIRGINIA

FALCO

Sill-line goes to CHURCH...

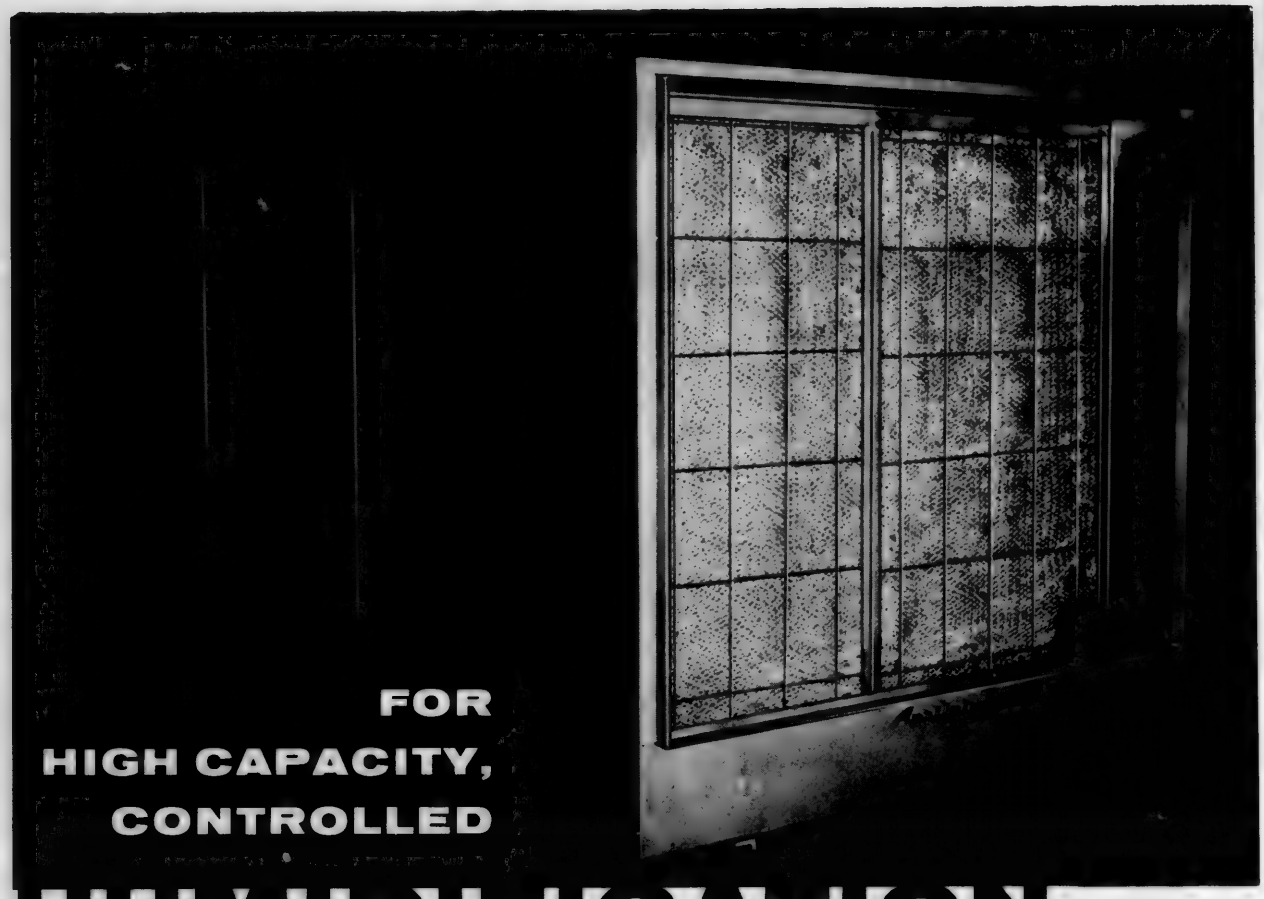
Not all kinds of heating equipment look well in church.
So when Charles W. Pollitt of Philadelphia designed
the St. Paul Reformed Episcopal Church in Oreland, Pa.,
he chose Nesbitt Sill-line to grace its modern interior.
Sill-line offered the perimeter protection needed
and its long trim lines conformed to the contemporary design.
You could do some nice things, too, with this
"world's most beautiful perimeter radiation."

One-piece back panel;
Two mediums: steam or hot water;
Three-step easy installation;
Four-wall comfort;
Five enclosure styles;
Six baked enamel colors;
Seven standard lengths;
Eight types of heating element;
Nine matching accessories;
Ten-strike for value!

Nesbitt

SILL-LINE RADIATION

Made and Sold by John J. Nesbitt, Inc.
Philadelphia 36, Pa. Publication 30-1



FOR HIGH CAPACITY, CONTROLLED

HUMIDIFICATION

RP **Aprilaire**

AUTOMATIC-ELECTRIC HUMIDIFIERS

HIGH CAPACITY

Aprilaire Industrial Humidifiers (illustrated) are designed to provide capacity for practically any size requirements. Unit sizes up to 10 G.P.H.—can be installed singly or in a series of any number of units.

POSITIVE CONTROL

The Aprilaire introduces relative humidity as needed ...and only when needed. Automatic control eliminates possibility of lag or over-run.

FLEXIBILITY

Aprilaire industrial models are available for gas, steam or hot water heat source. Every model can be pedestal-mounted or suspended—according to individual requirements.

BACTERIA REMOVAL

The Aprilaire's entirely new principle of humidification, introducing humidity as a water vapor, provides an important plus feature—the removal of up to 70% of all bacteria in the air stream circulating through the unit.

ISOTHERMAL OPERATION

The Industrial Aprilaire has no temperature effect on the humidified air. Exhausted, humidified air is discharged at the same temperature it enters the unit.

MINIMUM MAINTENANCE

Because the only liming or water solids deposits occur on the inexpensive, replaceable evaporating pads... mechanical difficulties from these usually troublesome deposits are eliminated.

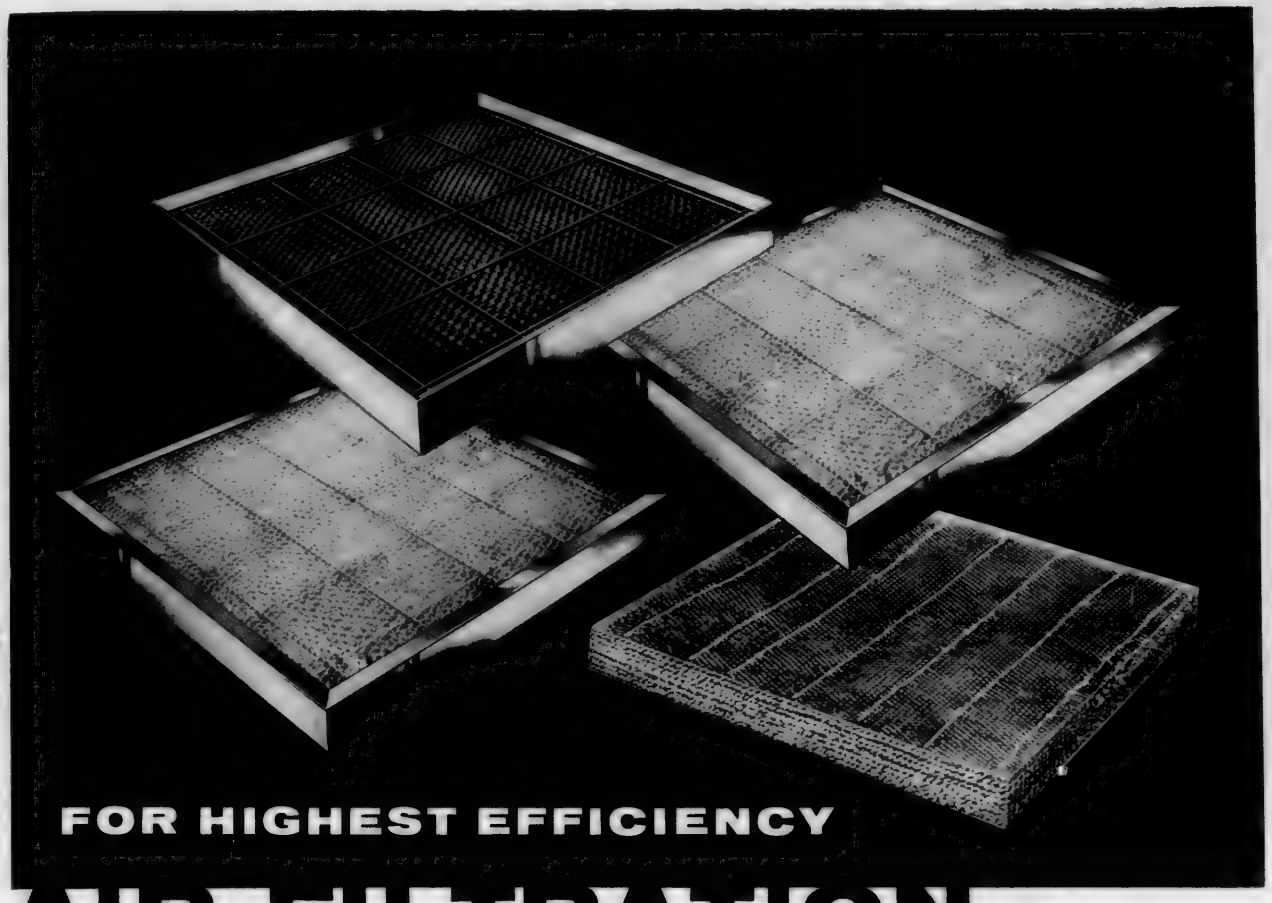
INDUSTRIAL AND RESIDENTIAL MODELS AVAILABLE-WRITE FOR COMPLETE INFORMATION

see our catalog in (S) PLANT ENGINEERING FILE or write for copy

RP ... PRODUCTS OF RESEARCH

RESEARCH PRODUCTS Corporation

Dept. 913, Madison 10, Wisconsin



FOR HIGHEST EFFICIENCY

AIR FILTRATION

RP AIR FILTERS

FOR RESIDENTIAL, COMMERCIAL, INDUSTRIAL APPLICATIONS

EZ KLEEN

The aluminum, washable air filter that features easy cleaning and moderate cost. Standard E Z Kleen in ½", 1" and 2" thicknesses—350 F.P.M. rating. Multi-Velocity E Z Kleen in 1" and 2" thicknesses—520 F.P.M. rating. Easily washed and re-coated with Filter-Coat (dust and dirt removing adhesive) or Super Filter-Coat (dust and odor removing adhesive) for like-new efficiency.

GREASE FILTER

Aluminum grease filters for kitchen exhaust systems. End grease nuisance and resulting costly maintenance to motor and blower equipment...reduce fire hazard ...increase sanitation. Attractive aluminum improves kitchen appearance. Strong, lightweight, easy-to-handle.

INDUSTRIAL FILTER

Economical, lightweight, easy-to-clean, aluminum filters for both high or low velocities. Reduce operating costs through longer service life and top performance. Ideal for new or existing installations.

PAINT ARRESTORS

Inexpensive, disposable filter pads that remove paint overspray solids from exhausted air in paint spray booths. Simple installation, using holding frames, in banks of any size. R P Paint Arrestors are efficient in operation...versatile...economical in operating and initial costs...save floor-space...reduce down-time.

WRITE FOR COMPLETE INFORMATION

RP ... PRODUCTS OF RESEARCH

RESEARCH PRODUCTS *Corporation*

Dept. 913, Madison 10, Wisconsin

"WHAT? FAR-AIR filters pay for themselves in 18 months?"

"Yes, sir. Many users report FAR-AIR filters save 75% of their original cost every year, too!"

"How come?"

"For one reason, they handle 50% more air than 'bargain brands,' so it takes 1/3 fewer filters to do the job."

"Yes, but they cost more."

"True, but you buy them only once—not over and over."

"It costs money to clean them."

"...but they hold 50% more dirt, last longer between cleanings and clean easier, so maintenance cost is 'way down."

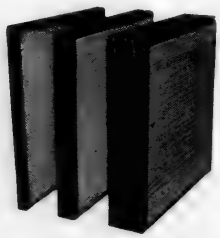
"In fact, FAR-AIR filters will save you enough over 'cheap brands' to pay for your original filter investment many times over."

"You prove that and I'll buy!"

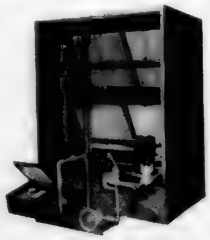
"Yes, sir, we'll start a test in your plant tomorrow."

If you would like a demonstration of FAR-AIR savings in *your* plant under *your* operating conditions, write or wire for a free evaluation test. You'll be glad you did!

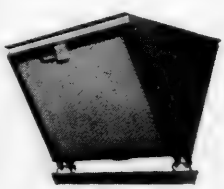
Typical **FAR-AIR** *Products*



1", 2" and 4" Thick Panel Filters



Self-Washing Filter



Grease Eliminator

FARR COMPANY

LOS ANGELES • NEW YORK • CHICAGO • NEW ORLEANS

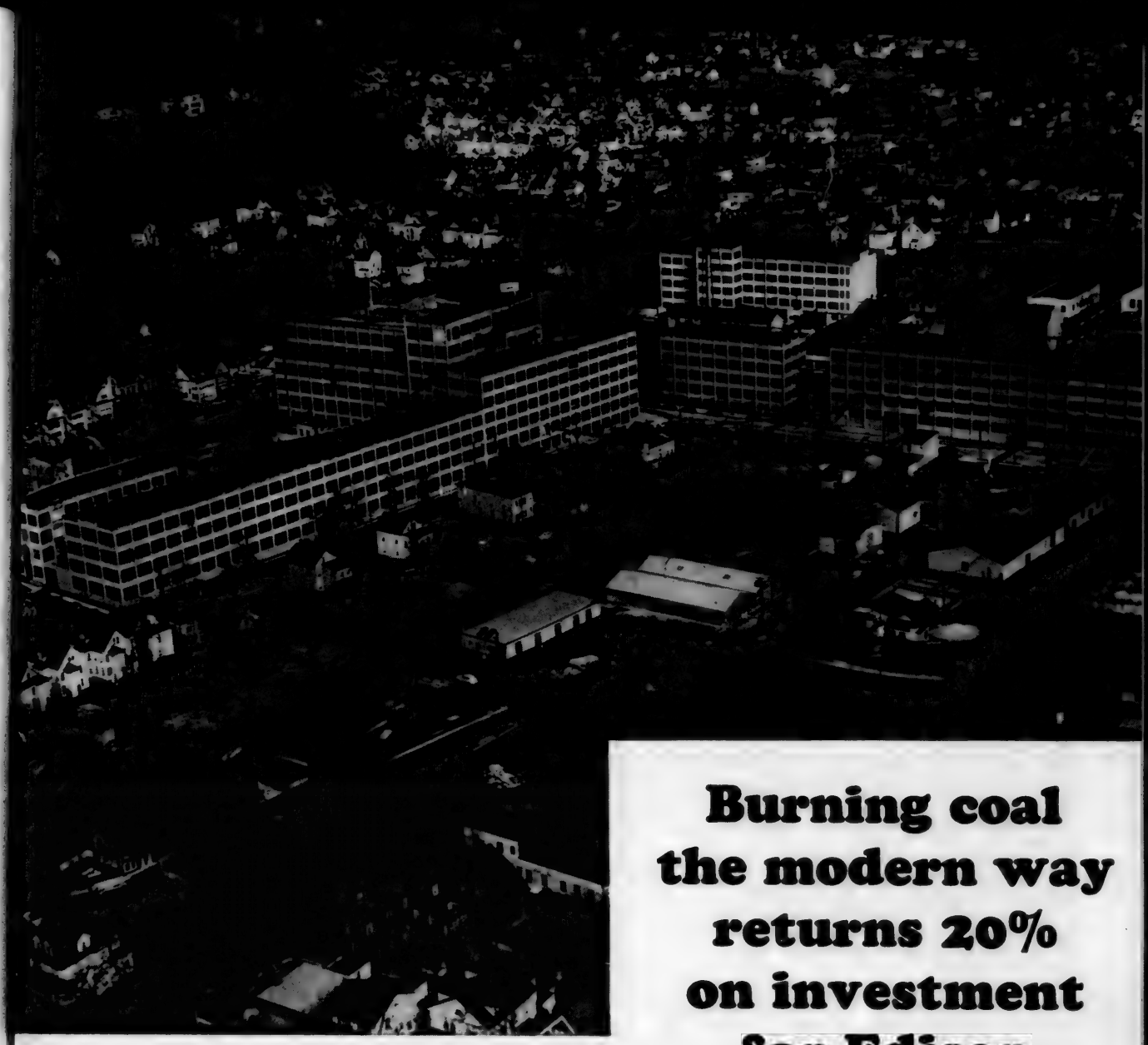
Manufacturing Licensees:

Farr Company Mfg. Ltd.
Montreal, Canada

The Clyde Engineering Co. Pty. Ltd.
Sydney, Australia

Intermit Ltd.
Birmingham, England

Originators of **FAR-AIR** *Certified Filter Service*



Burning coal the modern way returns 20% on investment for Edison

Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

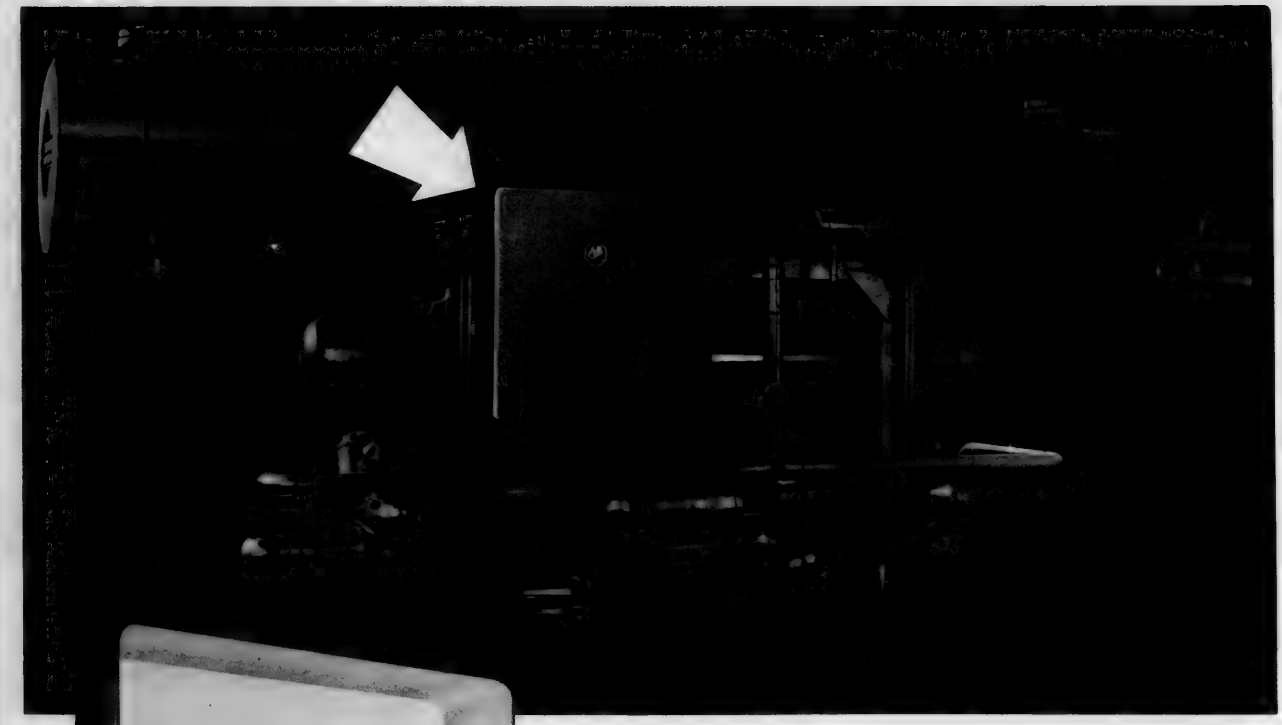
In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

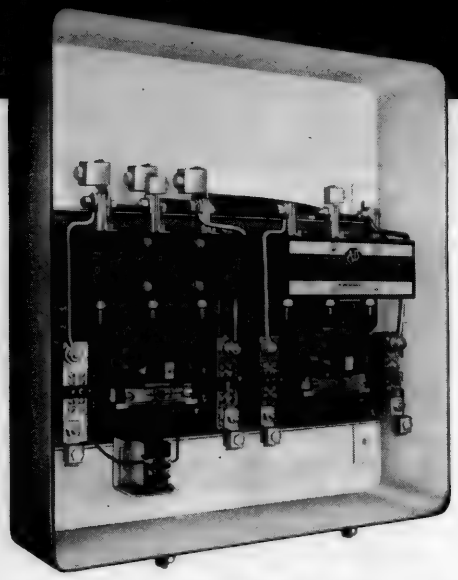
The firm of Thomas A. Edison, Inc., West Orange, N. J., was faced with a common problem—rising steam plant costs. A thorough survey indicated the need for modernization of the power system. As a result, six 30-year old boilers were replaced with two 60,000 lb./hr. units. FD and ID fans, pneumatic ash systems, coal pulverizers and related equipment were installed.

Modernization has paid off at Edison! Steam-generating capacity per sq. ft. of boiler room space has been doubled, labor costs have been cut, fuel costs are down, boiler efficiency is up 16% and modernization gives a 20% annual return on a net investment of 2.7 mils per BTU!

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

BITUMINOUS COAL INSTITUTE
Southern Building • Washington 5, D. C.





Bulletin 736 part winding starter in NEMA Type 1 general-purpose enclosure with cover removed to show the two solenoid starters and the pneumatic timer mounted under left starter. Two thermal overload relays are mounted on each starter.

THE POWER COMPANY IS SATISFIED!

Airtemp Water Chiller Accelerates Smoothly with Part Winding Motor and A-B Part Winding Starter

Manufacturers of large refrigeration and air-conditioning installations frequently are confronted with power company motor starting current limitations to reduce line voltage drop and eliminate light flicker. The part winding motor with its special starter may be a low cost answer for such a requirement.

The motor is accelerated for a preset interval determined by the Bulletin 849 pneumatic timer mounted on the Bulletin 736 part winding starter. Thereupon, the second winding of the motor is connected in parallel across the line. The motor then goes to full speed and torque without line disturbance.

Allen-Bradley Bulletin 736 starters are available for 2-step starting of motors up to 200 hp, 220 v; 400 hp, 440-550 v. They can also be furnished for 3-step starting up to 200 hp, 220-440-550 v. Write for the Allen-Bradley Handy Catalog.

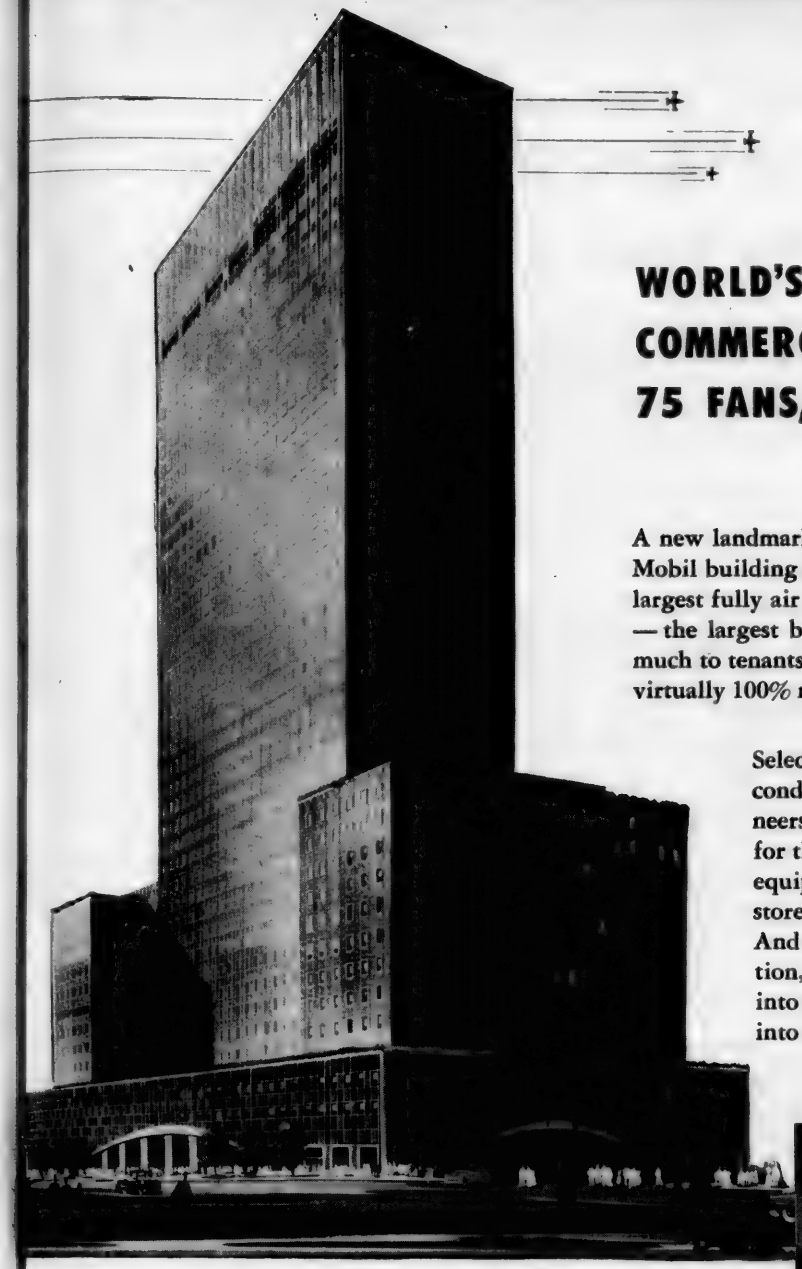
Allen-Bradley Co.
1330 S. Second St.
Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

A-B Quality

The Sign of QUALITY Motor Control

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY



WORLD'S LARGEST AIR CONDITIONED COMMERCIAL OFFICE BUILDING USES 75 FANS, 22 CONDITIONING UNITS BY "BUFFALO"

A new landmark at Lexington and 42nd St., New York, the Socony Mobil building is a model for office buildings of the future. It is the largest fully air conditioned commercial office building in the world — the largest built in New York in a quarter-century. Offering so much to tenants, it is little wonder that its 1,300,000 square feet were virtually 100% rented before completion.

Selection of "Buffalo" for all the fans and many of the conditioning units reflects the confidence which engineers, owners and contractors have placed in "Buffalo" for the past 79 years. You will find "Buffalo" air handling equipment in outstanding plants, hotels, institutions, stores and public buildings throughout this hemisphere. And everywhere, you will find it performing to satisfaction, because "Buffalo" builds the "Q" Factor* of Quality into every unit. If you have a job for air, write "Buffalo" into the plans to insure the results you want.

New Socony Mobil building, New York City. Galbreath Corp., owner; Jaros, Baum & Bolles, Consulting Engineer; Kerby Saunders, Inc., Air Conditioning Contractor; Turner Construction Co., Builder.

"Buffalo" Type BL Fans handle air in Socony Mobil building. These fans (some of them 13 feet high) plus "Buffalo" Axial Flow Fans and "Buffalo" Shortboy Ventilation Units move all the air. PCLW Dehumidifiers, Humidifiers and PC Air Conditioning Cabinets process the air for various zones.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY

BUFFALO, NEW YORK

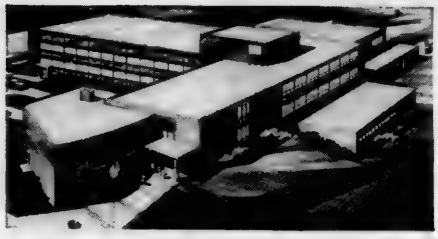
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

The Modern Approach to School Planning . . .

GET MORE COMFORT PER DOLLAR, SPEND LESS FOR HEATING



Increasingly high comfort standards, on the one hand, and pressure to reduce operating expenses, on the other, have centered interest on the importance of automatic temperature control. For both *comfort* and the *cost of comfort* in today's schools are determined largely by the efficiency of the control system.

In the impressive new Edison Junior High School* progressive school planners have demonstrated how it is easily possible to stress economy while making exceptionally complete provisions for student and teacher comfort. Some of the highlights of this up-to-the-minute comfort control system are shown by the accompanying photographs.

Those who subscribe to the modern idea of getting more comfort per dollar know that Johnson offers the most practical means of achieving it. The Johnson organization has over 70 years' experience in solving the temperature regulation problems of schools—*more specialized experience than anyone else!*

Johnson engineers apply this experience specifically to your individual problems—each Johnson System is designed and installed to meet the exact needs of the individual building, its occupants and its particular heating and ventilating equipment. This combination of unmatched experience and expert application results in control systems that are unsurpassed for comfort as well as economy.

Any building, small or large, can enjoy the comfort and money-saving advantages of a Johnson-engineered Control System. Why not discuss your temperature control problems with a Johnson engineer soon? His recommendations are yours without obligation. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

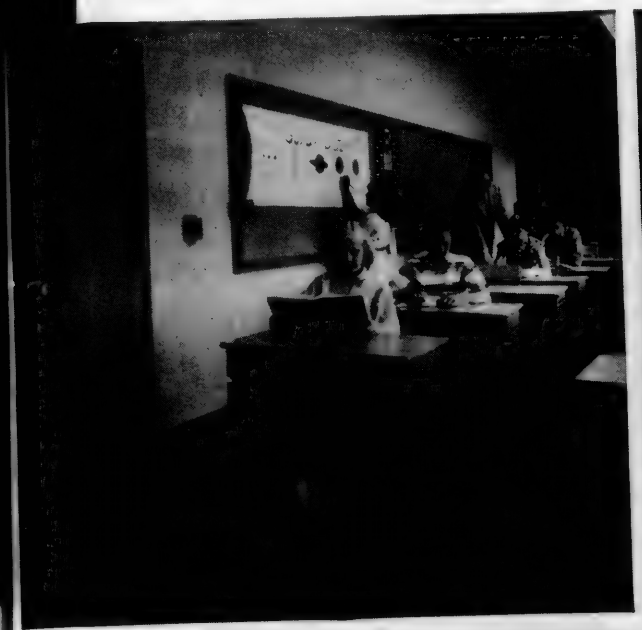
*Edison Junior High School, Sioux Falls, South Dakota. Harold Spitznagel & Associates, architects, Sioux Falls; Homer Bird, mechanical engineer, Minneapolis; Carlson & Glasgow, mechanical contractors, Sioux Falls.

JOHNSON CONTROL

SINCE 1885

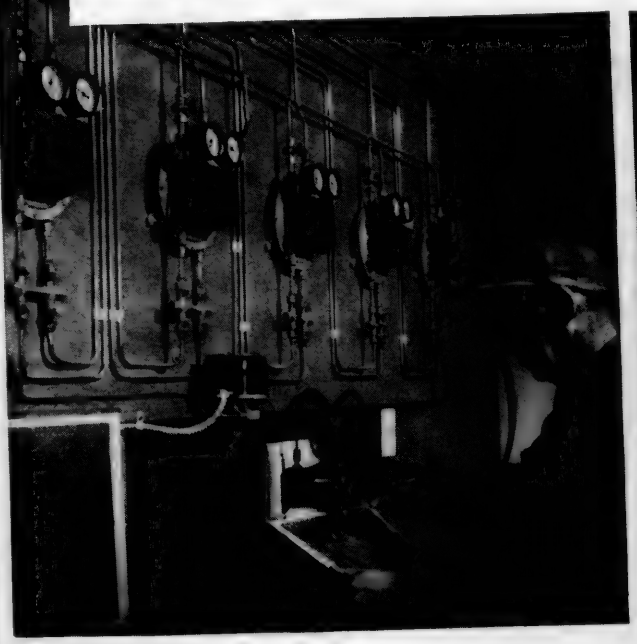
PLANNING • MANUFACTURING • INSTALLING

ON THE WALL of each classroom, sensitive Johnson Thermostats provide precision, waste-free regulation of both heat and ventilation. Use of *individual room* control makes certain that occupants of each room enjoy ideal temperatures, even though heat and ventilation requirements often vary widely from one classroom to another due to differences in exposure, occupancy levels, activities and other factors.



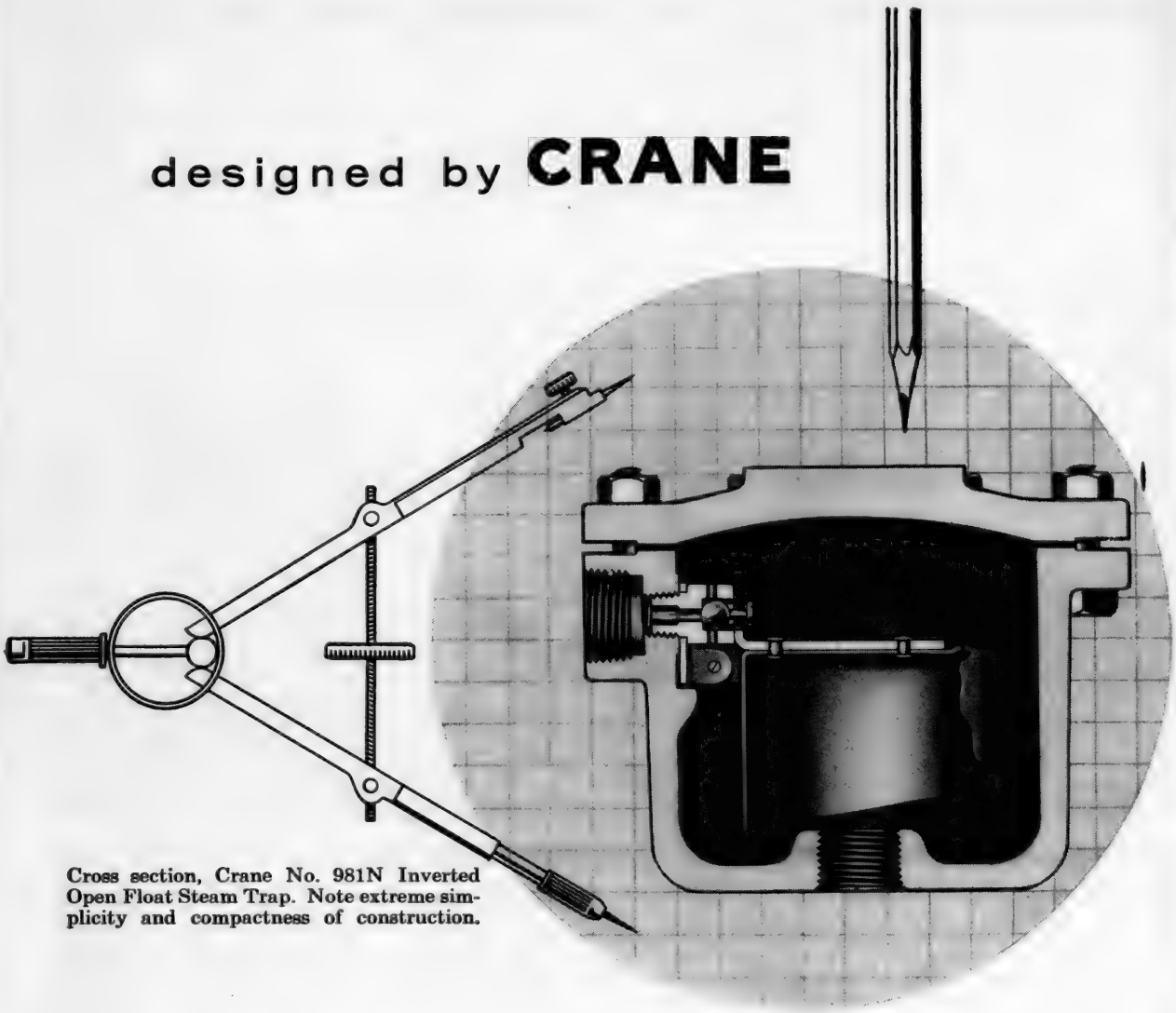
HEATING AND VENTILATING of this modern building are accomplished by a combination of central fan heating and ventilating units and convector radiation. The entire system is automatically coordinated at all times to insure the greatest possible operating efficiency. Corridors, the gymnasium, auditorium, cafeteria and other large spaces are as closely controlled as classrooms.

UNIFORM AIR DISTRIBUTION is essential to consistent comfort. Opening and closing of dampers as air is discharged at various points throughout the building could result in too little ventilation in some rooms, too much in others. Here, behind the scenes, Johnson Static Pressure Regulators keep the entire ventilation system in perfect balance and insure even air distribution at all points.



OUTDOOR AIR FOR VENTILATION is admitted through the action of Johnson Dampers and Damper Operators. Air is heated only enough to offset the effects of outdoor temperatures. The temperature of the water supplied to the convector radiation is also controlled according to outdoor conditions. This weather-compensated primary control adds greatly to comfort while minimizing fuel consumption.

designed by **CRANE**



Cross section, Crane No. 981N Inverted Open Float Steam Trap. Note extreme simplicity and compactness of construction.

to keep your steam lines

HOT, DRY and EFFICIENT

With an apparatus heated or operated by steam, you'll save fuel and insure operating efficiency by installing Crane Inverted Open Float Steam Traps—designed to drain condensate accumulation automatically and instantly.

The exceptionally rugged, simple construction of Crane Steam Traps provides high discharge capacities in relation to their size—permitting more compact installations. They are available in working pressures from 1 to 300 pounds saturated steam, sizes ½ to 1 inch.

For literature giving ordering and installation instructions, see your Crane Representative or write to address below.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

"CONSULTANT"

Prepared as 11 individual sections, thi
8½"x11", casebound book totals 152
information-packed pages, including 221
figures, 25 tables and numerous equations.

SECTIONALIZED EDITORIAL TREATMENT

- Sec. 1—General Principles of Foundry Ventilation and Foundry Hygiene Problems
- Sec. 2—Exhaust Hoods and System Design
- Sec. 3—Practical Design of Sand-Handling Ventilating Systems
- Sec, 4—Molding and Core Making Problems
- Sec. 5—General Principles for Melting and Pouring Operations
- Sec. 6—Cleaning Room
- Sec. 7—Housekeeping and Miscellaneous Control Measures
- Sec. 8—Radiation
- Sec. 9—Welding and Woodworking
- Sec. 10—Dust and Fume Collectors, Fans and Motors
- Sec. 11—Maintenance and Testing

Through adoption of wide-scale Safety Practices and Plant Modernization Programs, the foundry field has embarked on a crusade for unbiased acceptance among neighborhoods . . . workers . . . industry.

In line with the objective, and developed under direction of the AFS Safety, Hygiene and Air Pollution Control Program, *ENGINEERING MANUAL FOR CONTROL OF IN-PLANT ENVIRONMENT IN FOUNDRIES* is designed to:

1 "Assist in the standardization of dust eliminating equipment and improvement of shop operating conditions."

2 "Promote standards for dust elimination and control equipment in cooperation with manufacturers of such equipment."

Here is a factual . . . a reliable . . . foundry reference. It is the kind of dependable, thought-provoking material that should be readily available to every foundry engineer. Copies of *ENGINEERING MANUAL FOR CONTROL OF IN-PLANT ENVIRONMENT IN FOUNDRIES* should be on the work tables of management teams in both large and small plants.

Send Your Ord
NOW!

$6.00
AFS Members

$7.75
Non-Members

AMERICAN FOUNDRYMEN'S SOCIETY
Golf & Wolf Roads, Des Plaines, Illinois

Please send me _____ copies of *ENGINEERING MANUAL FOR CONTROL OF IN-PLANT ENVIRONMENT IN FOUNDRIES.* ☐ Remittance enclosed ☐ Send invoice

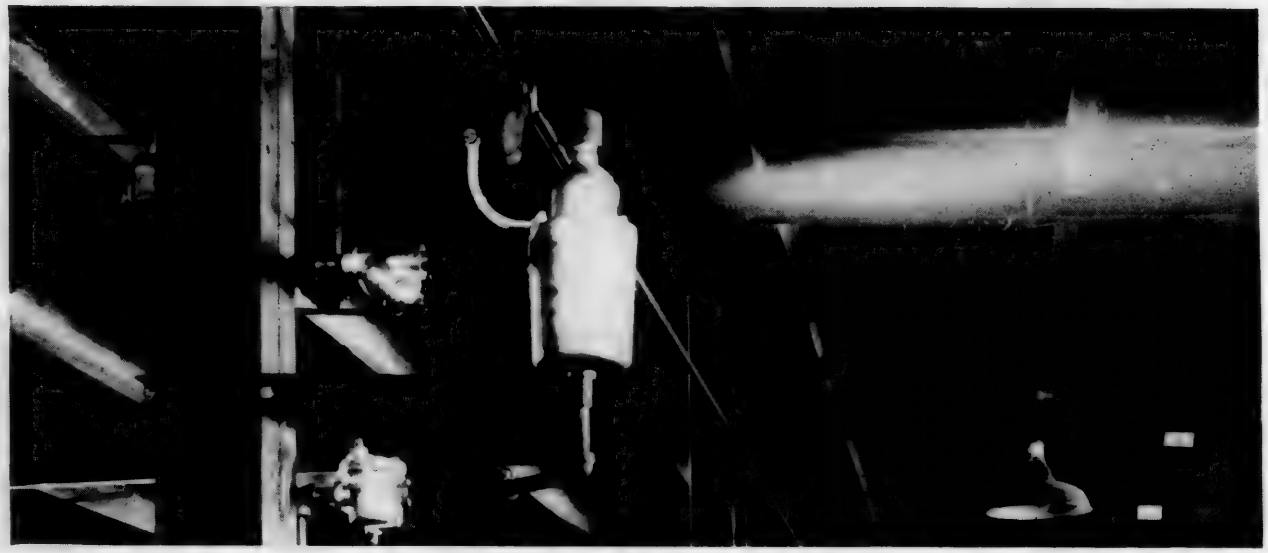
Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

When You Want to Humidify—



Consider the Advantages of ARMSTRONG *Steam* Humidifiers —Easy to Install and Maintain . . . Automatic, Accurate Control

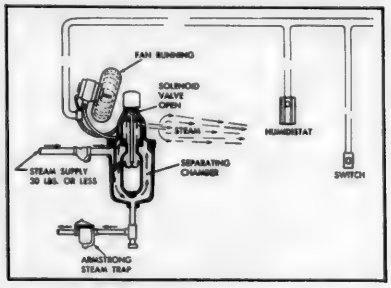
Whether you want to humidify an office for the health and comfort of employees, a rubber cement plant to prevent the hazards of static electricity, or a church to protect the pipe organ...Armstrong can help you do it better—and at less overall cost—with steam humidifiers.

They discharge steam directly into the room or into ducts or plenum chambers—either way you get large capacity at low cost. For explosive atmospheres, there are air-operated models. What's more, there's no mineral "dust" to settle onto employees and equipment.

Control is really accurate—relative humidity is held within 2 to 4% of setting. The steam disperses quickly and the sensitive humidistat responds quickly to slight changes in humidity.

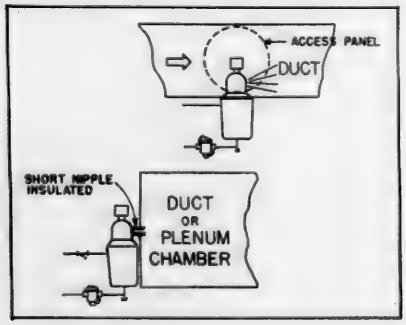
Maintenance is almost a forgotten word with these units. There's nothing to clog the valve or scale up the inside. Solenoid coils are glass wound. Valves and humidistats last indefinitely; fan motor bearings are lubricated for life.

There are other advantages, too. No damp spots—the unit has a steam jacketed inner chamber which evaporates condensation; the steam carries no water droplets. Effect on air temperature is negligible. No odor—pure steam is odorless. Quiet operation — unit is acoustically designed.



HOW THEY WORK

When humidistat calls for moisture, solenoid steam valve opens and fan starts. Steam enters separating silencing chamber, then goes to atmosphere. When humidity reaches desired level, valve closes and fan stops.



BULLETIN No. 500
gives complete information. Tells:

- How relative humidity affects profits, health, comfort and safety.
- Why steam is best for humidification.
- How users of Armstrong Steam Humidifiers profit.
- How to select and install units.
- Complete physical data and prices.

Send for your free copy today! Call your local Armstrong Representative, or write:

NEW!

Automatic, controlled evaporative-type central humidifier

. . . the HUMID-I-MAKER

Air is blown across surface of heated water and into central duct. No mineral dust. High capacity. For use with hot water, steam and warm air heating systems — in homes, offices, greenhouses, schools, etc.

Bulletin No. 9001 gives complete information—write today.

ARMSTRONG MACHINE WORKS
8461 Maple Street • Three Rivers, Michigan

SATISFACTION GUARANTEED

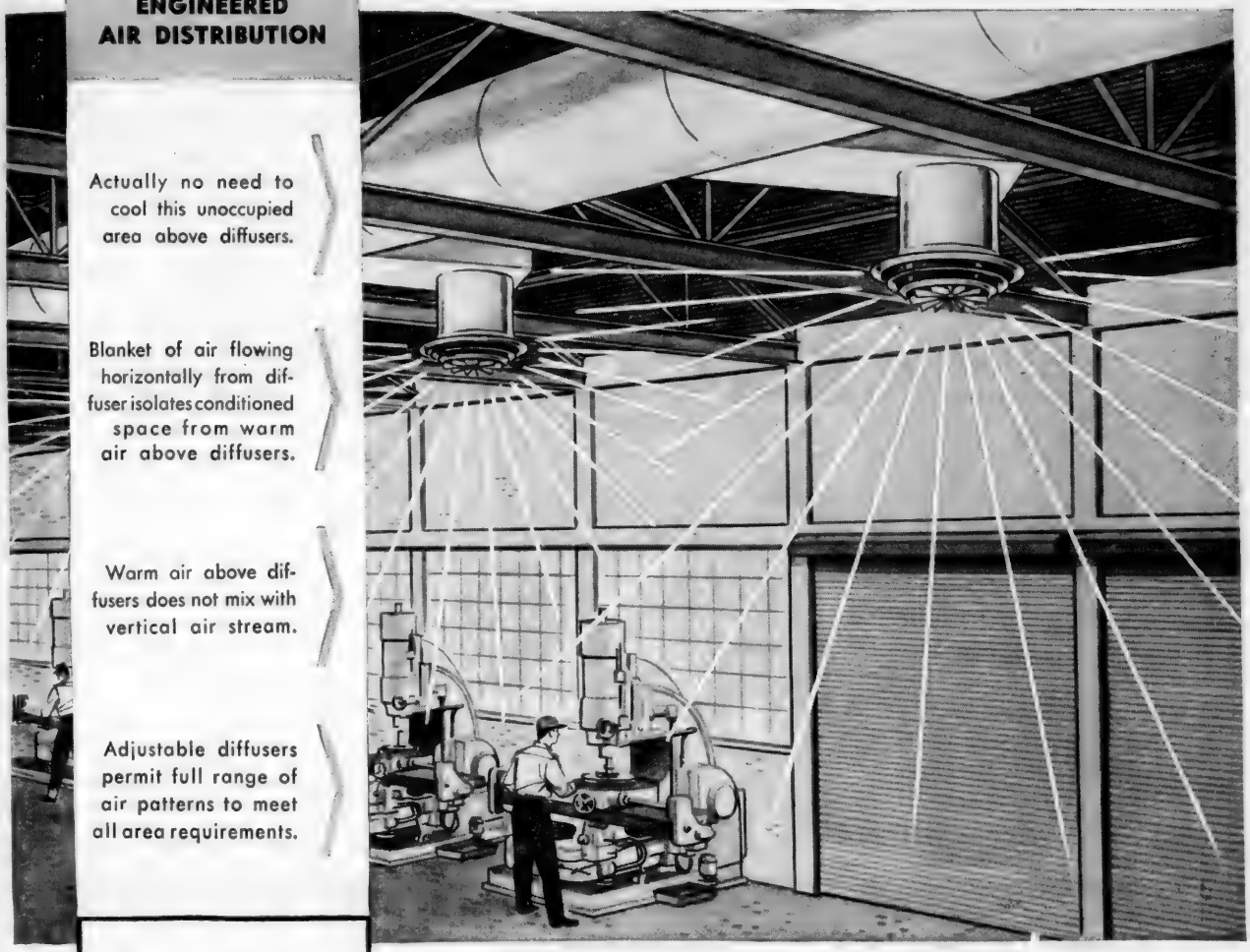
THE MARK OF QUALITY

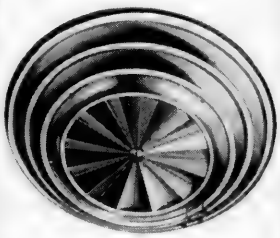
BARBER COLMAN

Uni-Flo

ENGINEERED AIR DISTRIBUTION

Industrial Venturi-Flo Diffuser reduces waste cooling of overhead space


Actually no need to cool this unoccupied area above diffusers.
Blanket of air flowing horizontally from diffuser isolates conditioned space from warm air above diffusers.
Warm air above diffusers does not mix with vertical air stream.
Adjustable diffusers permit full range of air patterns to meet all area requirements.



New Model BP Industrial Venturi-Flo Diffuser for high or low ceiling cooling and heating in industrial plants, gymnasiums, auditoriums, hangars, TV studios, etc.

Now you can efficiently deliver spot or area cooling from an unfinished ceiling and virtually ignore the heat load of the large unoccupied space overhead.

Performance of the new Industrial Venturi-Flo Diffuser, as illustrated here, is guaranteed by Barber-Colman Company when diffusers are applied in accordance with published data.
Get complete details from your nearby Field Office, or write us today!

Only Barber-Colman Company combines skills in *both* air distribution and automatic controls for *undivided* responsibility.

BARBER-COLMAN COMPANY

Dept. M, 1102 Rock Street, Rockford, Illinois. Field Offices in principal cities

THE MARK OF QUALITY

BARBER COLMAN

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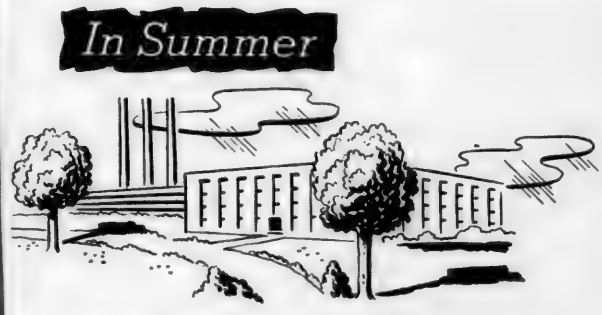

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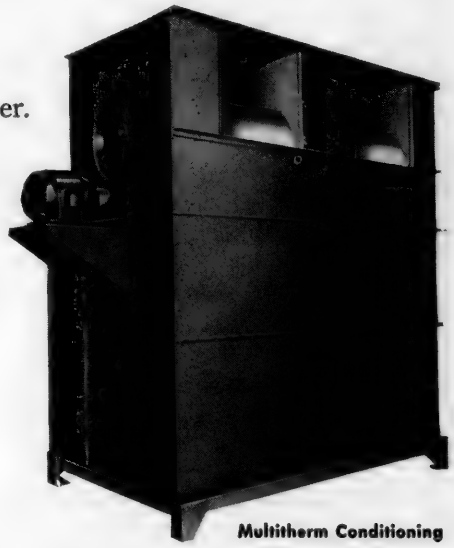

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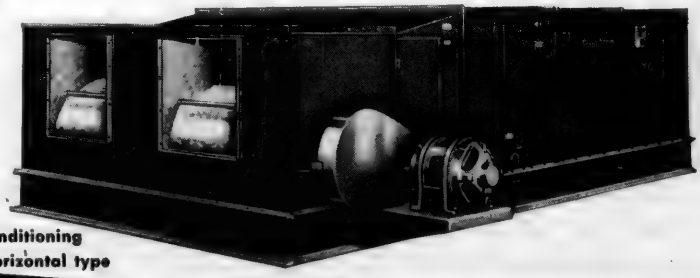

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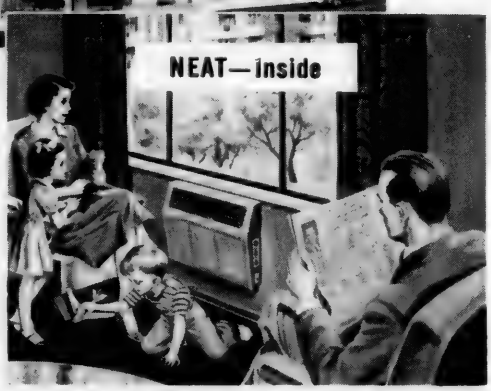

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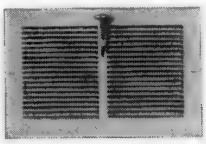

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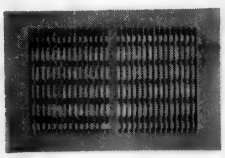

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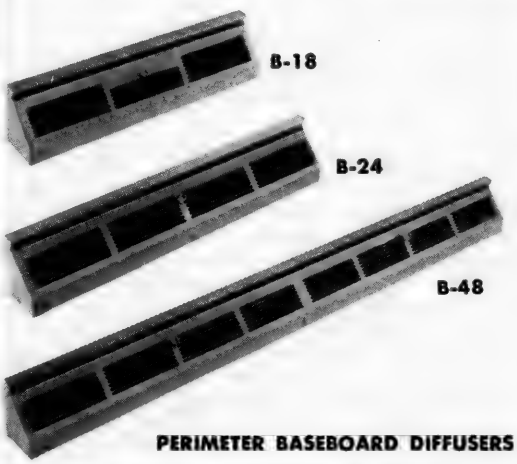

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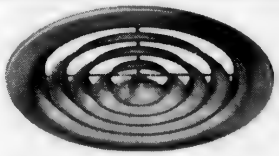

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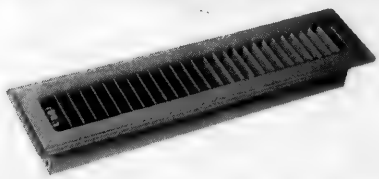

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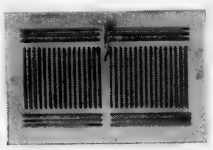

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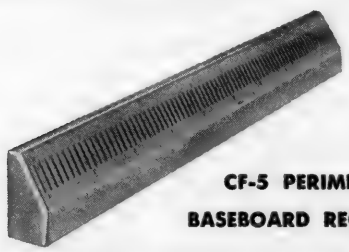

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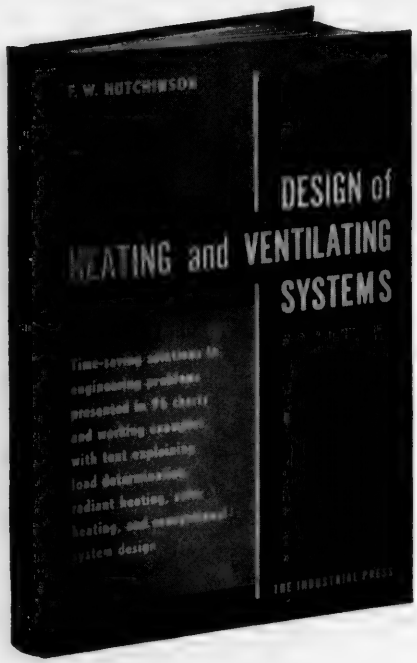

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The author is Professor of Mechanical Engineering at the University of California. He is the author of "Industrial Heat Transfer" and co-author of a number of books on panel heating, refrigeration and air conditioning. His knowledge of the field is well grounded on practical experiences as well as theory, as he acts as consultant for many industrial firms.

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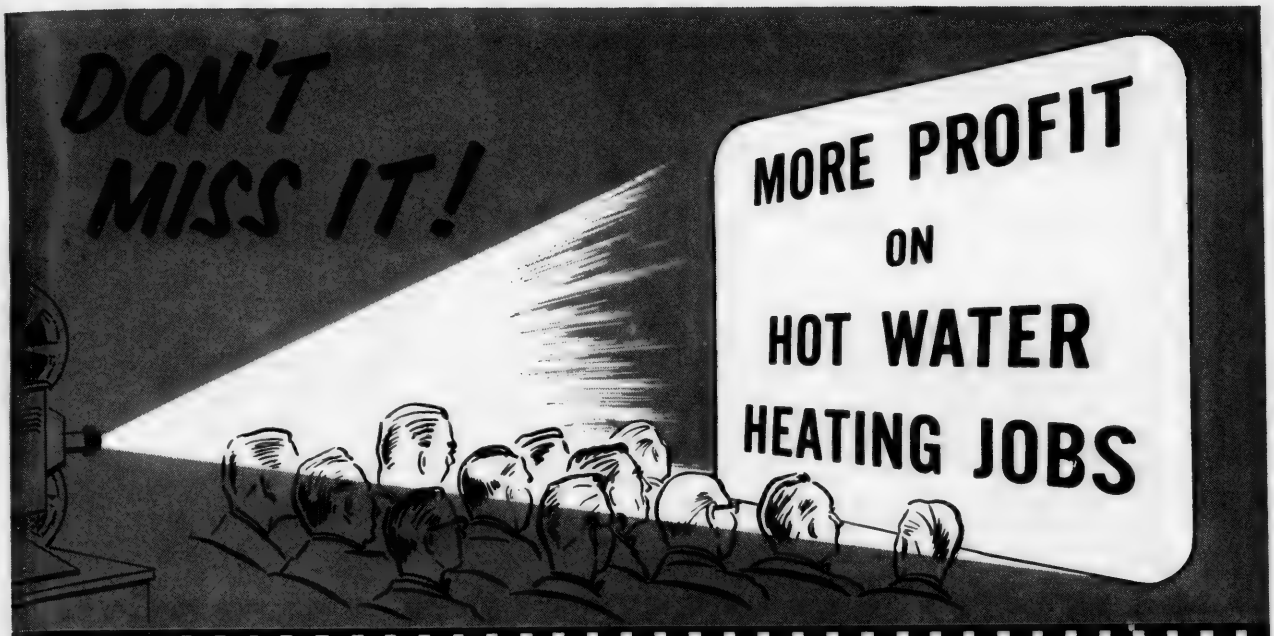

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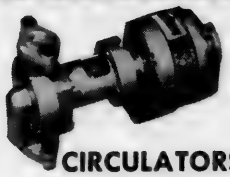
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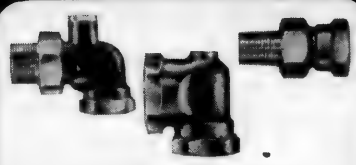
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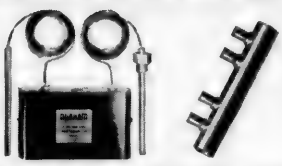
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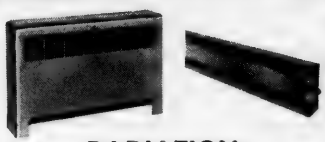
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Types and Applications of

POWER ROOF VENTILATORS

ROBERT H. AVERY
Manufacturers' Representative, Avon, Conn.

There are many varieties of power roof ventilators available to a prospective purchaser. Here is a classification of these types and their field of application as well as other positive aids for the intelligent and systematic selection and installation of power roof ventilators.

In discussions of power roof ventilators several descriptive terms are often used interchangeably, such as roof fan, power roof fan, and power roof ventilator. Of these terms, power roof ventilator is the one which is most commonly used by equipment manufacturers. The equipment in question can take many forms and shapes. The feature common to all units in this class is the fact that air enters the unit vertically upward, and the air mover rotates in a horizontal plane. Acceptance of this definition eliminates propeller fan penthouses, and self-contained centrifugal fan vent sets which are sometimes located on building roofs.

There are two distinct types of power roof ventilators, the axial and the centrifugal fan type.

Axial Power Roof Ventilators

The axial power roof ventilator is characterized by a weatherproof housing enclosing a propeller fan. The propeller rotates in a horizontal plane when it is moving air. Axial power roof ventilators can be classified into three fairly distinct types. (This classification is only for the purposes of convenience in presenting this information and is not an official one). These three classes are auxiliary, upblast, and blackout.

Auxiliary Type Axial Power Roof Ventilators

This name can be used to describe a general group of axial roof fans in which the propeller is mounted in the base of a gravity roof ventilator. A typical unit of this type is shown in figure 1. The propeller can be either belt driven or direct driven, and in the case of belt-driven units, the motor can be located either in or out of the air stream. Housings can be fabricated out of the usual choice of metals for ventilators of this type. Propeller blades can be either stamped or cast metal. Back draft dampers can be either self-acting, motor-operated, or arranged for manual operation.

The most important feature of this type of ventilator is its dual capacity. Under conditions which favor good exhaust as a gravity ventilator, the propeller need not be operated, and ventilation by siphon effect will occur. When a higher ventilation rate is required, the fan can be turned on, and the full capacity of the unit utilized. For this dual operation it is not possible to have automatic back draft dampers, since the normal siphon effect would be reduced or destroyed by the resistance to opening which they offer. If required, either manual or motor-operated dampers should be used.

In the selection of a power roof ventilator of this type it is important to be certain that the exhaust capacity is based on the propeller alone, or that if it is based on the combination of the siphon effect of the gravity ventilator plus the air handling capacity of the propeller, such is made clear. General opinion is that these two forces are not additive, and that when acting as a power

"Modern building trends run to low, ground-hugging designs, and there has been objection on the part of architects to anything that will detract from this desired effect. Recognizing this fact, manufacturers of power roof ventilators have supplied designs which do the least to break up the architectural flow of lines. Selection of roof fans on this basis is not a matter of engineering but a matter of taste. It would be unfortunate if appearance led to the ignoring of mechanical features, but fortunately there is a variety of well-built power roof fans with different style housings to meet a diversity of tastes."

roof ventilator, the siphon effect of the gravity head is of slight influence.

Institutional Applications

The auxiliary type of axial roof fan is adaptable for use in exhaust systems for schools, hospitals, and other areas where quiet operation is required. In most cases, units of this type are limited to exhaust from open areas where there is very little system static pressure, and where the propeller fans can operate at low tip speeds and still move the required amount of air.

Commercial and Industrial Applications

Higher tip speeds are allowable for power roof fans of this type when used in commercial buildings and factories. As a result, either greater exhaust volumes of air can be handled, or the fans can be selected to operate against higher static pressures. Motors mounted in the air stream are available with suitable enclosures for various types of exposures which might be met. Units are also adaptable to the handling of high temperature air or other gases, by the isolation of the motor in an insulated, ventilated compartment. In the case of belt-driven units, the motor is frequently located outside the ventilator, and the drive and bearings cooled by outside air drawn over them by the aspirating effect of the propeller.

Upblast Power Roof Ventilators

The upblast type of axial power roof ventilators is identified by the housing design which permits the exhaust air to be blown directly upward. This is normally accomplished by having butterfly dampers on the discharge side of the ventilator, and designing them so that they are fully opened by the blast of exhaust air, but closed when the fan is off so that they provide a weather-proof hood as illustrated in Fig. 2. In some makes of upblast power roof ventilators, the dampers are counter-balanced, but in a majority of cases they are made so that they are opened fully by the high velocity of the discharge air. This velocity is usually in the 1500 to 2000 fpm range. In the interest of low power requirements and the high discharge velocity required, the air movers are usually cast, airfoil section high efficiency propellers. As a result of this requirement, the application of these fans is limited to those areas where very quiet operation is not required.

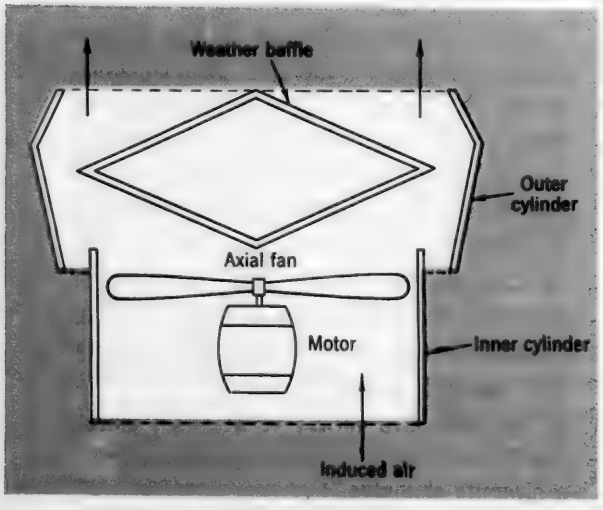

Fig. 1. General arrangement of a direct-driven auxiliary type axial power roof ventilator.

Damper-Trip

For certain types of industrial construction it is presently felt that, should there be a fire inside such a building, it would be in the best interests of fire protection and smoke control to leave all power roof ventilators running. Since a power failure is very likely, the fans might shut off, and the dampers would close. To prevent the dampers from closing, there is now available in certain upblast power roof fans, damper-tripping equipment. One type consists of a spring with extended arms held in tension by a fusible link. In the event that the ventilator shutters close during a fire due to power failure, the heat of the fire would cause the fusible link to break. When this happens, the spring tension forces the spring arms to open the dampers and to keep them open. The ventilator then acts as a relief vent, and allows the smoke and heat to escape from the building.

Blackout Type Axial Power Roof Ventilator

Power roof fans of this style consist of those axial power roof ventilators where the air is guided through a 180-degree turn after it has gone through the propeller, and is discharged downward as shown in Fig. 3. This style of housing became popular during the blackout days of World War II. One special feature of the blackout type of axial power roof ventilator is the low overall height which can be maintained. In certain applications this is an architectural requirement. The overall height can be reduced even more by installing the power assembly below the ventilator curb top. This is done by one manufacturer by installing the power assembly in a factory-supplied curb which can be dropped into the roof opening and flashed.

Again in response to architectural requirements for low silhouette fans, new groups of round ventilators have been introduced by various manufacturers. Most of these ventilators fit the category of blackout type power roof fans. Spun aluminum housings have become popular, and one of these features a nested power assembly. This nesting results in low overall fan height, while allowing the motor to be isolated from the exhaust air stream, and still providing accessibility to the motor for wiring and service.

Centrifugal Power Roof Ventilators

The simplest definition of a centrifugal power roof ventilator is that it is a centrifugal fan with vertical shaft, designed for radial discharge as illustrated in Fig. 4. To accomplish this purpose, certain parts can be identified in all power roof ventilators of this type.

Framework. In all fans except those involving spun metal construction there is an angle framework which rests on the curb, gives the ventilator rigidity, and supports the wheel, motor, and bridge. It also acts as a skeleton for the ventilator housing.

Bridge. The bridge is a separate assembly supporting the fan shaft, wheel and bearings as well as the motor.

Good bridge design incorporates rigidity of members, and accessibility to motor and, in the case of belt-driven fans, to bearings and fan shaft.

Vibration isolators. These are used to support the bridge and to prevent the transmission of mechanical noises and vibration from the bridge to the rest of the fan. The isolators can be of either the spring, rubber, or spring and rubber type. Where the latter type vibration isolators are used, it is frequently necessary to anchor the bridge to keep it rigid and prevent damage to the isolators while the fan is being shipped. Such anchor clips should be removed after the fan has been installed and before it is tested.

Fan wheels. These are primarily of the backward curved type. In addition to being designed in such a way as to provide maximum economical delivery of air at any given speed, larger fan wheels must be constructed so that the fan disc is suitably reinforced. Aluminum wheels are used by some manufacturers. They are lighter in weight, have better inherent balance and because of their lighter weight put less thrust on bearings, thus increasing bearing life.

Fan inlet. Inlets should be designed to provide air entry into the wheel with a minimum of pressure loss. Since most roof fans pull from large duct risers, acceleration of the air into the fan inlet can create a pressure loss manifesting itself as a whistle, if the inlet is not properly shaped.

Housing. In contrast with centrifugal blowers where housing design is important to the fan performance, the housing of a roof fan is primarily intended to protect moving parts from the elements and to act as a canopy over the roof opening. For most manufacturers, housing design is based on appearance and accessibility to moving parts for servicing. However, the housing must be designed with suitable dimensions to permit unrestricted discharge of air from the fan wheel.

Materials of Construction

Propellers with stamped blades for axial power roof ventilators are usually made of steel or aluminum. Airfoil axial fans are usually cast aluminum; however, they can be made of cast semi-steel and steel for high temperature applications. Whenever the service justifies the cost, propellers can be fabricated out of other metals, but the availability varies with different manufacturers.

Centrifugal fan wheels likewise are usually made of steel or aluminum. An aluminum wheel is usually more costly but has the advantage of being rust proof and spark proof, as well as having the characteristics previously mentioned. For special corrosion resistance, wheels can be made of special alloys.

Ventilator housings break down into two general types: the spun metal type and the sheet metal type.

Spun metal housings are primarily made from aluminum because it is most adaptable to spinning. Aluminum also has excellent corrosion-resisting and weathering characteristics. Where extreme salt air corrosion is anticipated, the spun parts can be anodized after fabrication. Some spun steel housings are offered, but their use would seem to be limited to periods of aluminum shortage. Copper can be spun, but since it work-hardens it must be annealed frequently during the spinning operation, adding much to the cost.

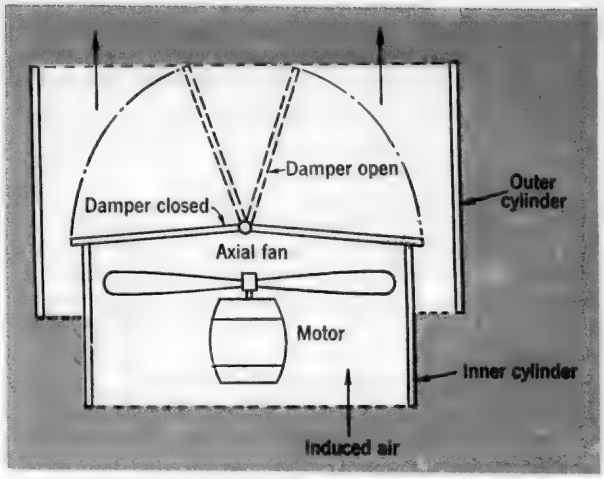

Fig. 2. Typical arrangement of an upblast type axial power roof ventilator.

Sheet metal housings can be supplied in the following metals: galvanized iron or steel, aluminum, copper, stainless steel, asbestos protected metal, and just about any other material which can be worked in a light sheet form. Coupled with suitable alloys or coverings for fan wheels and framework, power roof ventilators can be built of materials which will resist all but the most corrosive atmospheres.

There is a difference of opinion among manufacturers regarding suitable gages of materials for fan housings. The same result can be secured by using a heavy gage housing with little bracing or a lighter gage with more bracing. However, anyone selecting a power roof centilator should be sure that it has a substantially built housing. Likewise in comparing power ventilators, the more substantially built unit is most likely to be trouble-free in performance.

Motors

The selection of a motor for a power roof ventilator involves consideration of horsepower requirements, atmospheric conditions in which the motor must operate, service requirements, and motor starting load.

Motors up to ½ horsepower most commonly operate on single phase current, while ½ horsepower motors and larger are usually polyphase. Fractional horsepower motors less than 1/10 hp are frequently shaded pole, while the balance in the single phase group may be either split phase or capacitor start motors. Until recently, capacitor motors were required where 2-speed operation was specified, but 2-speed motors are now available in the split phase type. Polyphase motors are usually of the squirrel cage type. It is the most commonly accepted practice to require totally enclosed motors for axial fans when the motor is in the air stream. When they are out of the air stream, open type motors are normally used. For those cases where the motor will be exposed to explosive atmospheres, explosion-proof motors can be used. Likewise, for high temperature conditions, motors with glass-insulated or special plastic impregnated high temperature windings are available.

Direct-connected fan motors must be supplied with bearings capable of taking the thrust involved in sup-

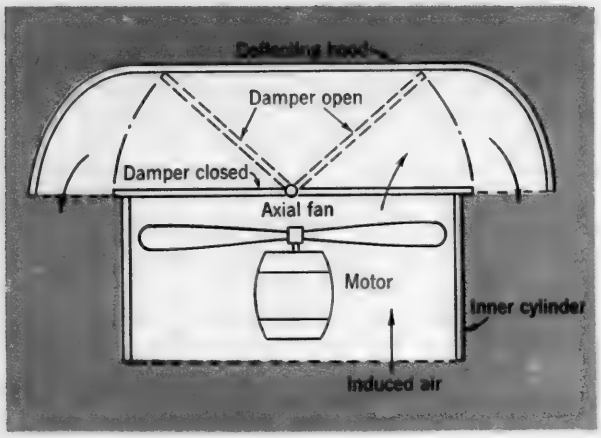

Fig. 3. General arrangement in sketch form of a blackout type axial power roof ventilator.

porting the fan wheel. To do this requires ball bearings for all but the smallest fans. Small fractional horsepower motors occasionally have sleeve bearings, but at least one manufacturer features ball bearings for all fans even down to those of 1/25-hp size. The best of the ball bearing motors are the new sealed bearing type which require lubrication only once every ten years of normal service.

Two-speed motor operation is desirable in at least two sets of conditions. The first is for summer-winter operation. The fans are run on high speed during the summer, and on low speed during the winter, thus conserving heat. The second condition where two-speed motors are desirable exists when the power roof ventilators are exhausting from areas where there is a variable occupancy load. Locker room exhaust fans, for instance, may be operated on high speed during occupancy, and operated on low speed the rest of the time. In this way the normal amount of exhaust required for control of body odors during occupancy is provided, and then during the other periods a lesser amount of exhaust prevents a buildup of a stale odor.

Most power roof ventilators require motors with a normal starting torque. Where stronger than normal torque is required, capacitor start motors can be used for single phase operation.

Electrical Wiring

Many local electrical codes require a disconnect means to be in sight of every electric motor. In order to accomplish this, many power roof ventilators are supplied with disconnect switches in the housings as a standard part of the equipment. In any case where disconnects are not standard, they can still be supplied if specified. To be certain that a disconnect switch is included where required, it is best to call for it in any specifications. Disconnect switches for two-speed motors will vary with local requirements. On single phase motors any possibility of an accident is avoided if all three leads to the motor are disconnected, although a strict adherence to some codes requires the breaking of only the hot line, and this may be done with either a two pole or a one pole switch depending on the wiring. Polyphase two-speed motors normally require six leads from the speed changer or 2-speed magnetic starter to the motor. To break all six lines usually requires a drum switch. In some areas a drum switch does not qualify as a disconnect unless it has a *positive off*. If a drum switch is in the fan housing it is important to be certain that the person wiring the switch does not use it as a speed selector, and thus prevent the use of the 2-speed characteristic. As an alternate to the use of a drum switch where a magnetic starter is used, a lock-out switch may be wired into the starter holding circuit. When this lock-out is installed at the fan, its use prevents the fan from starting by keeping open the starter holding circuit.

Back Draft Dampers

Back draft dampers are used to prevent the reverse flow of air down through power roof ventilators when they are not operating. Such back draft is especially noticeable during colder months. These dampers are designed to open when the fan is in operation and to close when the fan stops.

Self-acting back draft dampers most frequently consist of multiple lightweight damper leaves set in a frame and designed to open by the flow of air through them. Properly designed self-acting back draft dampers have very little resistance to air flow through them. If they do not open fully they may create a noise problem, as noted elsewhere. If they are not installed correctly, the back draft dampers may remain open after the fan has been stopped.

Motor operation of back draft dampers assures a positive full opening and closing. It also permits heavier construction throughout the shutter itself. There is also the opinion that the use of an electric damper operator, which will hold the damper blade wide open, can well increase the efficiency and the exhaust of any fan unit, by acting somewhat as straighteners. By the same token, a self-acting damper, especially at the lower velocities, can very possibly reduce the rated capacity of any ventilator.

Extended Bases

The back draft dampers for centrifugal power roof ventilators are frequently installed inside the curbs on which these ventilators rest. For this reason they are inaccessible for servicing except by removing the whole power ventilator. One manufacturer overcomes this problem by providing a standard fan with an extended base section in which the dampers can be installed, and through which they may be serviced. The installing contractor only has to drop this fan on the curb since the damper is factory installed. The weight of the fan is supported by corner angles which rest on the curb, and which are an integral part of the fan framework. Other manufacturers of centrifugal power roof ventilators have extended curb bases available as accessory items. These are separate pieces of equipment, designed to fit on a low curb, and in turn to carry the weight of the roof ventilator. For this reason they must be substantially constructed and reinforced.

Fan Noise

Some day fan noise will be measured and reported in the form of a number to describe a reproducible value. This system of reporting noise in terms of such values as sones has not yet been accepted industry-wide. Until it has been accepted, experience will still be the best guide

in determining acceptable noise levels. The problem of noise in axial fans is so very complex that it is best to give the noise level requirements to the manufacturer of your choice, and let him recommend a fan. In the case of competitive bidding the following guides may be kept in mind:

1. For purposes of comparison all propellers should be of the same diameter, or as close to the specified diameter as possible.
2. A fan rotating at a higher speed than specified can be expected to be noisier unless otherwise proven so.
3. The greater the number of blades a propeller has, the more quiet it will most likely be.
4. Propellers with an odd number of blades are occasionally more quiet than those with even number of blades.
5. The greater the brake horsepower, the less efficient the fan, and probably therefore the noisier it will be in operation.

Axial power roof ventilators may also be noisy for some of the reasons which will be given later for centrifugal power roof ventilators, and which result from the way the power roof ventilator is constructed rather than the type of air mover which is used.

The most common sources of noise in centrifugal power roof ventilators are the following:

Wheel noise. Fans which must operate at high tip speeds to move a specified amount of air are usually more noisy than wheels of corresponding diameters moving the same amount of air at a lower tip speed. Wheel designs vary for both engineering and economic reasons, and so the ventilation engineer must be sure that the fan selected for a job meets this low tip speed requirement. Tip speed alone is not a criterion for quiet operation, but it is an important clue. Experience to date indicates that on systems where the static pressure is approximately ¼ inch, tip speeds selected in the 3000 to 3500 fpm range will insure very quiet operation. Relatively higher tip speeds are permitted at higher static pressures, so that 3800 fpm is permissible when the static pressure is ½ inch.

Motor noise. A-c motors have a characteristic hum which can be transmitted back through the exhaust system unless vibration isolators are selected to absorb this hum. Obviously noisy motors should be rejected at the time of installation in the fan. Motor bearings, when defective, create a characteristic chatter which can only be eliminated by replacing the bearing assembly or the whole motor.

Power assembly noise. Fan wheels should be statically and dynamically balanced before being installed in a fan. Even though this is done there may still be some vibration in the power assembly operation. Such vibration, while not objectionable mechanically, will create a drumming unless the fan is equipped with properly selected vibration isolators.

Fan inlet noise. It is not uncommon to design a system for velocities of 800 to 900 fpm in the duct risers to the fan. However, the air entering the inlet throat travels at much higher velocities. Noise at this source is minimized by having the throat area as large as possible, and by using a well-formed inlet to provide minimum energy losses, and so prevent any inlet whistle.

Back draft damper chatter. Frequently in an effort to get very quiet operation, systems are selected with duct risers for air velocities as low as 500 fpm. Such an air movement is not adequate to open fully the self-acting type of back draft damper, and as a result it operates in a partially opened position, and chatters. Where conditions are such that very low velocities are required in a duct riser, motor-operated dampers should be used.

Housing rattles. All metal-to-metal surfaces in centrifugal power roof fans should be designed for a tight fit when the housing is closed and the fan in operation so that rattling of metal against metal will be minimized if not eliminated.

Roof construction. Certain types of steel trusses are now being used which do not have, and are not required to have, the rigidity of older heavier construction. In certain cases, such as multipurpose rooms in schools, large roof fans are required. Despite the use of adequate vibration isolators in the fan itself, the total live weight when the fan is operating transmits low frequency vibrations to the roof, causing it to act as a sounding board. Lightweight fans are less likely to create this problem, and so the overall installed weight of a fan must be reviewed by the designing structural engineer.

Architectural Considerations

Power roof ventilators help provide exhaust systems which are lowest in cost. They occupy no usable floor space and so help keep down building cost on dollars-per-square-foot basis. They eliminate the necessity of long runs of ductwork to fan rooms and thus reduce sheet metal costs. The elimination of the long (and usually large) runs of ductwork also serves a secondary purpose of allowing more space for, and easier access to, the utilities which must run through joists between ceiling and roof. This is especially important in those types of single story school buildings where a skylight is used for corridor illumination. Multiple roof fan installations with very little ductwork frequently have many advantages which can be secured with little or no cost over that required for installations of comparable capacity using one large exhaust fan and duct system.

Now that the design trend is to low, ground-hugging

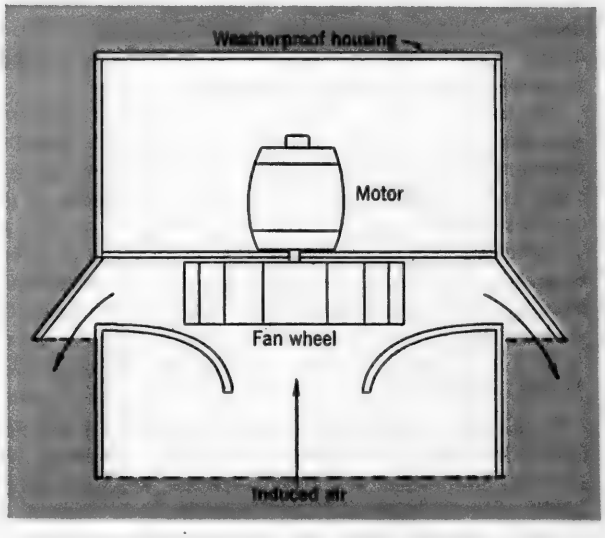

Fig. 4. Typical arrangement of a direct-driven centrifugal power roof ventilator.

buildings, there has been an objection on the part of architects to anything which will detract from this desired effect. This has been recognized by manufacturers of power roof fans and they have supplied designs for buildings which will do the least to break up any flow of lines, and which will add to the appearance of these buildings. Selection of roof fans on this basis is not a matter of engineering but a matter of taste. It would be unfortunate if appearance led to the ignoring of mechanical features, but fortunately there is a variety of well-built power roof fans with different style housings to meet a diversity of tastes.

The primary architectural requirement for power roof ventilators is a low silhouette. The minimum overall height which any fan can attain is limited by the height at which the fan wheel must discharge, and the additional space required above the wheel for the motor and drive compartment. Room must also be found for back-draft dampers in the duct riser to the fan.

Traditionally the discharge height in colder climates for roof fans has been 20 in. from the roof. On old style buildings with parapets which could act as snow fences and pile up snow drifts on the roof such an overall height was found necessary. On new style buildings this condition no longer exists. One of the larger manufacturers of roof fans now shows a discharge height starting at 5 in. for smaller fans, and going up to 12 in. for larger units. The traditional 20 in. height is now reserved for extremely northern latitudes.

Use of a narrow fan wheel will cut down on the overall height of a fan, but such a practice is not justified since this saving in height will have to be made up by noisy or inefficient operation.

The size of the motor compartment is restricted by the frame size of the motor required for the job. One manufacturer eliminates the motor compartment by mounting the motor outboard of and alongside the fan wheel. This arrangement does eliminate much of the motor compartment height, but in turn requires an unsymmetrical fan housing.

The nesting of the motor compartment within the fan housing has been one of the most successful methods of reducing overall fan height. Space limitations restrict this design to direct-connected fans, but within their performance range, fans of this style have considerably less height from the discharge point to the top of the fan.

The proper comparison of heights of two fans of corresponding capacity must take the fan discharge point as the common datum, since it is the fan height when correctly installed which counts, and not the distance from curb base to fan top.

Symmetry is being emphasized in fan design as it becomes increasingly important that fans present an attractive appearance at any angle from which they may be viewed.

Airflow Conditions

Regardless of the type of fan used, exhaust systems have many design characteristics which are well known and well established. While consideration is always given to the need for good airflow conditions at the inlet to a blower type exhaust fan, this is not always true of centrifugal roof fans. If a roof ventilator is to exhaust the quantity of air for which it was selected, inlet airflow conditions must be as good as possible. Where there is a long duct riser up to the fan there is a natural straightening of the air stream. On single story buildings where a duct riser must be short, duct turns should be used at the elbow from the horizontal to vertical to provide uniform flow up the riser and prevent a pileup of air which will result in reduced fan efficiency and in fan vibration.

Check List for Power Roof Ventilator Selection

After an exhaust system has been designed, and the air volume and system static pressure calculated, the selection of a power roof ventilator is the last step in assuring that the installed system will operate successfully. Decisions will have to be made about all of the following characteristics, and while many of the desired features need not be mentioned specifically if a certain make of fan is named, they should not be overlooked when an alternate make may be offered for a job involving competitive bidding:

1. Axial or centrifugal type fan
2. Rpm, tip speed and/or wheel diameter
3. Power requirement (This involves a consideration of the brake horsepower of the fan as well as the motor horsepower)
4. Motor features
    a. Enclosure
    b. Type of bearings
    c. Lubrication requirements
    d. Number of speeds
    e. Motor disconnect at ventilator
5. Housing and wheel
    a. Material of construction
    b. Gage of materials in housing
    c. Housing angle framework construction
6. Power roof ventilator general appearance and overall height
7. Back draft dampers
    a. Self-acting or motor operated
    b. Accessibility for servicing
        1. Inside curb
        2. Integral with fan housing
        3. In separate curb

Summary

An effort has been made to classify the various types of power roof ventilators, and to discuss the design and application of these different types. Units of certain manufacture may not fall exactly into any particular one of these arbitrary classes, but inasmuch as any power roof ventilator has characteristics in common with any of the group outlined, its design can be evaluated, and its field of application established. Whether a new style, or an old one, the selection of a substantially constructed power roof ventilator will assure engineer, contractor, and owner that such a fan will not only exhaust air as rated, but will do so quietly and dependably with a minimum of maintenance.

Acknowledgments

The author acknowledges the valuable suggestions and criticisms made by John Snow, Davidson Fan Co.; K. Pohle, Hirschman Pohle Co., and L. Jenn, Jenn Air Products Co., which have been of great help in the preparation of this article.

Calculating the Heat Requirements of a Snow Melting System

Part 5 — Northwest Central Region

WILLIAM P. CHAPMAN

This is the fifth article of a series which will eventually cover all parts of the U.S. where snow melting systems are likely to be used. Previous installments covered a portion of the Northwest, Michigan, Ohio, Western Pennsylvania, Salt Lake City region and the Chicago, St. Louis and Memphis areas.

The first article summarized the basic equation for heat required for snow melting and defined the free area ratio as the ratio of slab area free of snow to total slab area.

In order that each installment of this series can be understood, the opening information on class of systems and the explanation of the four tables are repeated.

THE total heat output of a snow melting system depends on the rate at which it melts the snow, and this rate in turn depends on the relative importance of rapid snow removal among the different types of applications. Snow melting systems can be classified as follows:

Class I (minimum): Residential walks or driveways and interplant areaways;

Class II (moderate): Commercial (stores and offices) sidewalks, and driveways and steps of hospitals; and

Class III (maximum): Toll plazas of highways and bridges, and aprons and loading areas of airports.

These classifications depend upon the allowable rate of snow melting. For example, a residential system does not have to melt snow as rapidly as a commercial system. In fact, a depth of snow of an inch for an hour or so during a heavy storm might not be objectionable with a residential system. On the other hand, a store manager would claim the system was inadequate if half an inch accumulated on the sidewalk in front of his store. The difference, then, between a Class I system and a Class II system is in the ability of each system to melt snow. The one feature that is common to all classes is that the systems must be adequate for some combination of weather factors. Or, the designer wants to be able to say that he will pay to melt snow whenever conditions are milder than some critical value but he is willing to have an inadequate system for a given fraction of the time. In other words, the designer will run a calculated risk providing

TABLE 1—GENERAL INFORMATION ON SNOWFALL, NORTHWEST CENTRAL REGION

Item	Great Falls, Mont.	Cheyenne, Wyo.	Rapid City, S. D.
Approximate mean number of days with an inch or more of snow on the ground	100	100	100
Average number of inches of snowfall per year	53.5	56.4	33.2
Greatest snowfall in 24 hours, inches	11.0	16.5	18.3
Greatest depth of snow on the ground, inches	18.3	21.0	18.0
Mean number of days per year with snowfall of 1 inch or more	20 (83 with trace or more)	17	34† (68 with trace or more)

† Mean number of days with precipitation of 0.01 inches water equivalent for the months October to March, incl.

he knows the odds of that risk. For a residential system, where initial cost must be at a minimum, the designer must accept more frequent snow accumulations.

Naturally, the owner is not concerned about an explanation of why there is an accumulation of snow on the sidewalk. It is immaterial whether the accumulation is due to excessive snowfall or whether it is due to an extremely cold snowfall. In both cases, the ultimate reason is that an inadequate flow of heat is reaching the surface. The true analysis of heat output, then, depends on an analysis of the weather. This is true of all three system classes.

The total heat requirements of a snow melting system are determined, therefore, by (a) the total area of the snow melting slab, (b) the rate at which the snow is to be removed, and (c) the values and frequency distribution of each of the pertinent climatic variables (humidity, wind, temperature, and snowfall). Obviously (c) varies from city to city and, due to the complexity and number of calculations to obtain a frequency distribution of the four variables, the evaluation of (c) has been virtually impossible. However, by the use of punched cards and statistical tabulating machines, data have been derived so that the heat requirements for a given city can be simply presented.

The designer needs two types of information. First, the most severe combinations of variables on which to base his *design output*, and, second, the heat required over the season so that *operating costs* can be determined. These data are given in Tables 1, 2, 3, and 4 which follow and which cover three cities in the Northwest Central region of the U. S.

Table 1

The first table gives some generalized information on snowfall and snow on the ground. The next to last item, "Greatest depth of snow on the ground" indicates the greatest depth to which snowfall has ever accumulated. Other items are self-explanatory.

TABLE 2—DATA FOR DETERMINING OPERATING CHARACTERISTICS OF SNOW MELTING SYSTEMS IN THE NORTHWEST CENTRAL REGION[1]

Period of No Snowfall

City	Air Temperature, Deg. F[2]: Over 32	Air Temperature, Deg. F[2]: Below or Equal to 32	Mean Temperature During Freezing Period[6]	Wind Velocity, Freezing Period,[6] mph
	Per-cent of Winter Hours with No Snow at Above Temperatures			
Great Falls, Mont.	49.0	46.2	16.5	14.4
Cheyenne, Wyo.	46.4	49.8	21.5	15.3
Rapid City, S. D.	45.2	51.6	19.3	12.9

Period of Snowfall[3]

City	Hours of Snowfall[5]: Per-cent	Hours of Snowfall[5]: Hr. per Year	Free Area Ratio, Ar	Required Output, Btu per Sq. Ft. per Hr.[4]: 0–49	50–99	100–149	150–199	200–249	250–299	300–349	350–399	400–up	Maximum Output, Btu per Sq. Ft. per Hr.
				Frequency Distribution of Snowfall Hours at Above Outputs, Per-cent[5]									
Great Falls, Mont.	4.8	174	1	26.2	27.6	16.7	16.4	7.5	4.6	0.3	0.5	0.2	451
			0	94.6	4.8	0.6	—	—	—	—	—	—	138
Cheyenne, Wyo.	3.8	138	1	16.5	26.2	19.4	13.1	8.6	4.7	4.2	4.7	2.6	499
			0	94.3	5.4	0.3	—	—	—	—	—	—	129
Rapid City, S. D.	3.2	116	1	29.7	29.0	16.0	8.4	6.3	3.6	1.9	2.0	3.1	581
			0	97.6	2.2	0.2	—	—	—	—	—	—	102

[1] The period covered by this table is from Nov. 1 to March 31, incl., with February taken as a 28¼ day month. Total hours in period = 3630.
[2] The percentage in Columns 2 and 3 plus the percent under operating time total 100%. Note that "Hours of Snowfall" does not include idling time, and is not actual operating time. See text.
[3] Snowfalls of trace amounts are not included; hence, "Hours of Snowfall" includes only those hours of 0.01 inches water equivalent per hour snowfall.
[4] Output does not include allowance for back or edge losses since these depend on slab construction.
[5] Percentages total 100% of the number of hours per year of snowfall.
[6] "Freezing Period" is that during No Snowfall when the air temperature is 32 deg or below.

TABLE 3—DESIGN DATA FOR SNOW MELTING SYSTEMS, NORTHWEST CENTRAL REGION

City	Design Output, Btu per (Hour) (Sq Ft)		
	Class I System[1]	Class II System[2]	Class III System[3]
Great Falls, Mont.	84*	138	372
Cheyenne, Wyo.	83	129	425
Rapid City, S. D.	58*	102	447

[1] For Class I (residential) Systems, the design output is set at that required heat output (see Table 2) when $A_r = 0$ at the 98th percentile of the frequency distribution; that is, where 98% of the hours have this output or less.
[2] For Class II (commercial) Systems, the design output is the maximum output when $A_r = 0$ in Table 2 (last column).
[3] For Class III (industrial) Systems, the design output is determined by the following four requirements: (1) Output is never exceeded for two consecutive hours; (2) Output for $A_r = 1$; Table 2, is at least 1 Btu per hour per sq ft greater than maximum output for $A_r = 0$; (3) A_r is greater than or equal to 0.5 the maximum requirement shown in Table 2 for $A_r = 1$. That is, $q_d = q_s + q_m + 0.5\ (q_e + q_h)$ for the conditions where $q_t = q_s + q_m + q_e + q_e$ are a maximum; (4) The free area ratio A_r is unity for at least 98% of the hours listed in Table 2.
* See Table 4. Idling Rate is greater than Design Rate.

Use of the Tables

Example: Assume the State Department of Highways has decided to put a cloverleaf type overpass at an important highway junction in Cheyenne. You have been asked to select the equipment and estimate the operating costs.

Normally a traffic intersection would require a Class III system. However, on reviewing Table 3 there is a large disparity between Class II and III systems. The reason is apparent when one studies the frequency distribution of Table 2. Such a distribution indicates that the Class III design rate was based on rule 4, footnote 3, of Table 3. This rule states that the free area ratio is unity for 98% of the cases. For automobile traffic, however, a free area ratio of 0.5 is adequate. It seems reasonable, therefore, to reduce the design rate somewhat.

There is no precise way to select a design rate other than those shown in Table 3. One extreme case—which should be conservative—is to take the mean value between the maximum requirements for $A_r = 0$ and $A_r = 1$. This would give a value of $A_r = 0.5$ when both maximum values occurred simultaneously. This is an extreme case and actually would never occur. As a result, a value selected in this way would be the maximum output for $A_r = 0.5$.

For Cheyenne the maximums for $A_r = 0$ and 1 are 129 and 499 Btu per hour per square foot. The mean value is 314 Btu per hour per square foot. From Table 2, note that only 11.5% of the cases occur at outputs greater than 299 Btu per hour per square foot. An acceptable design output for the cloverleaf snow melting system in Cheyenne should be 300 Btu per hour per square foot.

The operating costs for a system with an output of 300 Btu per hour per square foot and the frequency distribution of Cheyenne would be 19,100 Btu per year per square foot. This is based on the sum of the required outputs in Table 2 up to 299 Btu per hour per square foot, and in addition the 4800 Btu per year per square foot for the 16 hours per year where the demand exceeds 300. The system has a maximum output of 300, hence the demand at rates above the maximum must be taken at the maximum output for the system, or in this case $16 \times 300 = 4800$.

Northwest Central Region

This region lies between the Missouri River and the Rocky Mountains and north of the Platte River to Canada. The entire area is quite high, ranging from 3000 to 6000 feet in elevation.

Cheyenne, Wyoming, which represents the southern portion of the region, is located in rolling prairie. About 30 miles west of the city are the Laramie Mountains which have an elevation of 9000 feet. These mountains represent the eastern edge of the Rockies and extend north to the Big Horn range.

To the east lie the plains and rolling prairie lands. The eastern section of the region is represented by Rapid City, South Dakota. Except for the Black Hills, just west of the city, Rapid City is in a wide-open area and fairly representative of the prairie sections.

TABLE 4—YEARLY OPERATING DATA, NORTHWEST CENTRAL REGION

City	Idling			Melting		
	Time,[1] Hr. per Year	Rate,[2] Btu per (Hour) (Sq. Ft.)	Output,[3] Btu per (Year) (Sq. Ft.)	Time,[4] Hr. per Year	Class	Output[5] Btu per (Year) (Sq. Ft.)
Great Falls, Mont.	1677	111.6	187,000	174	I	13700*
					II	15400
					III	19100
Cheyenne, Wyo.	1808	77.7	140,000	138	I	9730
					II	13200
					III	20200
Rapid City, S. D.	1873	86.4	162,000	116	I	7450*
					II	8250
					III	13400

[1] From Table 2, Column 3 × 3630 (hr per year).
[2] Rate when idling, Btu per (Hr) (Sq Ft) = $(0.27V + 3.3)\ (32 - t)$, where V = wind velocity from Column 5, Table 2, and t = air temperature from Column 4, Table 2.
[3] Product of the two preceding columns.
[4] Hours of Snowfall, from Column 7, Table 2.
[5] Based on the condition that surface temperature is maintained at 33 deg until required output exceeds design output, at which time design output is used regardless of required output. Distribution of required output based on Table 2.
* Based on Idling Rate rather than Design Rate.

The northern portion of the region, represented by Great Falls, Montana, is considerably more mountainous than the south and east. Great Falls lies in a crescent open toward the northeast. The mountain ranges are about 35 miles to the east and south and 90 miles to the northwest. The elevation of Great Falls itself is only 3700 feet as compared to 6100 feet for Cheyenne and 3200 feet for Rapid City.

Because of the proximity of the Rocky Mountains to the west, the predominant weather factor is the wind. These winds from the west are downslope, hence are dry. During the winter these downslope winds (sometimes called chinook) displace polar air and cause a sudden warming of the air temperature. This can be of help in melting snow. The effect of the wind velocity is indicated by the frequency distribution of Table 2.

This region has relatively little precipitation, ranging from about 16 inches in the prairie land to 25 inches or so in the mountains themselves. Although the snowfall ranges from 33 to 53 inches per year, the snow is quite dry, an indication that the snowfalls are at low air temperatures. This feature, coupled with the high wind velocities, means that snow melting systems will have high convection, radiation, and evaporation losses.

The snowfall in all three cities is heavier during the spring than during the winter. For example, in Rapid City about one-fourth the annual average of snow occurs during March, and in Cheyenne and Great Falls March has the highest monthly average. The late snows reduce the growing season to a very short period. In Cheyenne the growing season is 130 days, but in Rapid City it is 151 days, and in Great Falls about the same. Since the snow season does stretch out until quite late, the "Hours of Snowfall" shown in Table 2 would be a conservative figure.

In general, this region has a severe climate for snow melting. This results in large equipment for Class III systems, and fairly high operating costs. The low air temperatures in this region lead to an interesting condition in Tables 3 and 4. In both Great Falls and Rapid City a Class I design rate is lower than the idling rate shown in Table 4. In computing the melting load of Table 4 for Class I systems, the idling rate was used rather than the design rate. The reason for using the idling rate is that the system would have less than an even chance to warm the slab to 32 deg prior to a predicted snowstorm. This condition does not occur in Class II or III systems.

Chief Power Sources in the United States

Coal continues to be the fuel for half the electric power generated in the United States and the sources of about 30% of the total energy production on a British thermal unit equivalent, according to Ralph L. Brown, fuel technologist, Bureau of Mines, in a paper "Energy Resources of the United States" presented before the fifth World Power Conference. With its production technology and economy being rapidly put in order and the current apparent leveling-off status of oil and gas reserves, coal may be near the point of assuming a greater share of electric power generation and total energy production of the United States. At present its fields of overall gain are in electric power generation and in the steel industry. The use of lignite for electric power generation approximately doubled in 1954. The sales in 1954 of anthracite-burning equipment, largely automatic or semiautomatic, were about 45% greater than in 1953.

Exploration has expanded in area coverage, Mr. Brown stated, in rate and depth of drilling, and in the number of well completions per year. Well completions in 1954 were 53,930, an increase of 9.4%. Wildcat drillings number 11,280, 2% over 1953, with the percentage of successful wells holding at about 17.5%, the average for the past five years. Wildcat drilling constituted about 20.9% of the total drilling. Total footage drilled (for oil and gas) in 1954 was about 210×10^6 feet. The ratio of oil to gas discoveries from wildcat or exploratory drilling was 1,598 to 399 in 1954.

Natural gas is the third important fuel in the United States and the source of the third largest amount of total energy and of electrical energy. In the period 1947-1954 the proved reserves increased about 28%. The net annual production increased about 67%. Whether the relatively small increase in reserves in 1954 over 1953 and a leveling in gas-well drilling in 1953 and 1954 indicates a trend or a result of regulatory rulings is an open question. Much more gas probably will be found because the geological possibilities are excellent over large areas and in different sections of the country.

Of the natural gas marketed, much goes to space heating and domestic use in new homes, and its transmission to centers of population continues to expand. In 1954, for example, about 17,700 km of new gas-transmission pipelines were constructed compared to 6,435 km for crude oil and 5,955 km for refinery-product transmission. Smaller amounts of gas go to electric power generation and other commercial uses. The industrial uses include carbon-black production (a use for gas that is declining), cement manufacture, thermal energy at petroleum refineries, propulsion equipment in gas transmission by pipeline, and the production of chemicals. Most marketed gas serves as fuel and as sources of energy. Of the gross production, a portion (perhaps about 15%) is used in repressuring oil wells, and about the same quantity is consumed in operating oil and gas fields.

Waterpower is also one of the large sources of electric power in the United States. The Federal Power Commission has reported that, as of January 1, 1953, the total potential production from waterpower was 109.5×10^6 kw, equivalent to about 491×10^9 kwh on an annual basis. Of this potential there was developed, as of January 1, 1953, installed capacity of 21.5×10^6 kw equivalent to an annual production of 112.5×10^9 kwh. This is about 20% of the potential capacity. As of July 1, 1954, the installed capacity had risen to 23.1×10^6 kw or 118.7×10^9 kwh on an annual basis.

Heat and power from the combustion of wood in the United States are estimated to be the sources of about 5% of the total energy and are not significant for the generation of electric power (0.3% or less of the total in 1954). Wood for space heating is a small use and largely local and in isolated places.

SUPERHEAT DATA—FREON-12

Temp. of Saturated Vapor, Deg.	Degree of Superheat								
	10			15			20		
	Volume, Cu. Ft. per Lb.	Enthalpy, Btu per Lb.	Entropy, Btu per Deg. R.	Volume, Cu. Ft. per Lb.	Enthalpy, Btu per Lb.	Entropy, Btu per Deg. R.	Volume, Cu. Ft. per Lb.	Enthalpy, Btu per Lb.	Entropy, Btu per Deg. R.
−10	2.0260	77.61	.1730	2.0522	78.23	.1745	2.0781	78.85	1761
−5	1.8392	78.16	.1725	1.8630	78.83	.1740	1.8866	79.50	.1759
0	1.6525	78.72	.1720	1.6739	79.44	.1735	1.6952	80.16	1750
5	1.5063	79.26	.1715	1.5229	79.99	.1731	1.5454	80.72	1746
10	1.3602	79.81	.1711	1.3779	80.55	.1726	1.3957	81 29	1741
12	1.3140	80.03	.1709	1.3311	80.77	.1725	1.3483	81.51	1740
14	1.2678	80.24	.1708	1.2843	80.99	.1723	1.3009	81.73	1738
16	1.2215	80.46	1706	1.2376	81.21	.1721	1.2536	81.95	1737
18	1.1753	80.68	.1705	1.1908	81.43	.1720	1.2062	82 18	1735
20	1.1291	80.89	.1703	1.1440	81.65	.1718	1.1588	82.40	1733
22	1.0922	81.11	.1702	1.1067	81.86	.1717	1.1210	82.62	1732
24	1.0554	81.32	.1700	1.0693	82.08	.1715	1.0833	82.84	1731
26	1.0185	81.53	.1699	1.0320	82.30	.1714	1.0455	83.06	.1729
28	.9816	81.75	.1697	.9947	82.51	.1713	1.0078	83.28	1728
30	.9447	81.96	.1696	.9573	82.73	.1711	.9699	83 50	1727
32	.9149	82.17	.1695	.9272	82.94	.1710	.9394	83 72	1725
34	.8851	82.38	.1694	.8970	83.16	.1709	.9089	83.93	.1724
36	.8553	82.59	.1692	.8668	83.37	.1708	.8783	84.15	1723
38	.8255	82.80	.1691	.8366	83.59	.1706	.8478	84.37	.1722
40	.7956	83.01	.1690	.8064	83.80	.1705	.8172	84.59	1720
42	.7714	83.22	.1689	.7819	84.00	.1704	.7924	84.80	.1719
44	.7472	83.43	.1688	.7574	84.22	.1703	.7676	85.01	.1718
46	.7230	83.63	.1687	.7329	84.43	.1702	.7428	85.23	.1717
48	.6988	83.84	.1685	.7084	84.64	.1701	.7180	85.44	.1716
50	.6745	84.05	.1684	.6839	84.85	.1700	.6932	85.66	.1715
52	.6547	84.25	.1683	.6638	85.06	.1699	.6728	85.87	.1714
54	.6348	84.45	.1682	.6436	85.27	.1698	.6525	86.08	.1713
56	.6149	84.66	.1681	.6235	85.47	.1697	.6321	86.29	.1712
58	.5950	84.86	.1681	.6034	85.68	.1696	.6118	86.50	.1711
60	.5751	85.06	.1680	.5833	85.89	.1695	.5914	86.71	.1710
62	.5587	85.26	.1679	.5666	86.09	.1694	.5746	86.92	.1709
64	.5423	85.46	.1678	.5500	86.29	.1693	.5577	87.12	.1709
66	.5259	85.66	.1677	.5334	86.50	.1692	.5409	87.33	.1708
68	.5094	85.86	.1676	.5168	86.70	.1691	.5241	87.54	.1707
70	.4930	86.06	.1675	.5001	86.90	.1691	.5072	87.75	.1706
80	.4245	87.02	.1671	.4309	87.89	.1687	.4372	88.75	.1702
90	.3670	87.96	.1668	.3728	88.85	.1683	.3785	89.73	.1699
100	.3187	88.87	.1664	.3238	89.78	.1680	.3289	90.69	.1696
120	.2423	90.57	.1658	.2466	91.54	.1674	.2509	92.50	.1690
140	.1860	92.09	.1651	.1897	93.11	.1668	.1934	94.14	.1684
160	.1433	93.35	.1643	.1467	94.46	.1660	.1500	95.57	.1678
180	.1105	94.22	.1636	.1136	95.46	.1653	.1168	96.70	.1669

Data interpolated from tables copyrighted by Kinetic Chemicals Div., E. I. duPont de Nemours & Co., Inc.

Temp. of Saturated Vapor, Deg.	Degree of Superheat								
	25			30			35		
	Volume, Cu. Ft. per Lb.	Enthalpy, Btu per Lb.	Entropy, Btu per Deg. R.	Volume, Cu. Ft. per Lb.	Enthalpy, Btu per Lb.	Entropy, Btu per Deg. R.	Volume, Cu. Ft. per Lb.	Enthalpy, Btu per Lb.	Entropy, Btu per Deg. R.
−10	2.1041	79.65	.1776	2.1300	80.45	.1791	2.1555	81.17	.1805
−5	1.9170	80.27	.1770	1.9472	81.03	.1785	1.9637	81.76	.1800
0	1.7299	80.89	.1765	1.7645	81.62	.1780	1.7719	82.35	.1795
5	1.5715	81.46	.1761	1.5976	82.19	.1776	1.6097	82.93	.1791
10	1.4132	82.03	.1756	1.4307	82.77	.1771	1.4475	83.51	.1786
12	1.3653	82.25	.1755	1.3822	83.00	.1770	1.3985	83.74	.1785
14	1.3173	82.48	.1753	1.1337	83.23	.1768	1.3496	83.97	.1783
16	1.2694	82.70	.1752	1.2852	83.45	.1767	1.3006	84.21	.1781
18	1.2214	82.93	.1750	1.2367	83.62	.1765	1.2517	84.44	.1780
20	1.1735	83.16	.1748	1.1882	83.91	.1763	1.2027	84.67	.1778
22	1.1353	83.38	.1747	1.1495	84.14	.1762	1.1636	84.90	.1777
24	1.0970	83.60	.1746	1.1108	84.36	.1761	1.1244	85.13	.1775
26	1.0588	83.82	.1744	1.0722	84.59	.1759	1.0853	85.36	.1774
28	1.0206	84.05	.1743	1.0335	84.81	.1758	1.0461	85.58	.1773
30	.9824	84.27	.1742	.9948	85.04	.1756	1.0070	85.81	.1771
32	.9515	84.49	.1740	.9635	85.26	.1755	.9753	86.04	.1770
34	.9205	84.71	.1739	.9322	85.49	.1754	.9437	86.27	.1769
36	.8893	84.93	.1738	.9010	85.71	.1753	.9121	86.49	.1768
38	.8587	85.15	.1737	.8697	85.94	.1752	.8805	86.72	.1766
40	.8278	85.37	.1735	.8384	86.16	.1750	.8488	86.95	.1765
42	.8027	85.59	.1734	.8130	86.38	.1749	.8231	87.17	.1764
44	.7776	85.81	.1733	.7876	86.60	.1748	.7975	87.39	.1763
46	.7525	86.02	.1732	.7622	86.82	.1747	.7718	87.62	.1762
48	.7274	86.24	.1731	.7368	87.04	.1746	.7461	87.84	.1761
50	.7023	86.46	.1730	.7115	87.26	.1745	.7204	88.06	.1759
52	.6817	86.67	.1729	.6906	87.48	.1744	.6994	88.28	.1759
54	.6611	86.89	.1728	.6698	87.70	.1743	.6783	88.50	.1758
56	.6405	87.10	.1727	.6490	87.91	.1742	.6572	88.72	.1757
58	.6199	87.31	.1726	.6281	88.13	.1741	.6362	88.95	.1756
60	.5993	87.53	.1725	.6073	88.35	.1740	.6151	89.17	.1755
62	.5823	87.74	.1725	.5901	88.56	.1740	.5977	89.38	.1754
64	.5653	87.95	.1724	.5729	88.77	.1739	.5803	89.60	.1754
66	.5483	88.16	.1723	.5556	89.99	.1738	.5629	89.82	.1753
68	.5312	88.37	.1722	.5384	90.20	.1737	.5454	90.03	.1752
70	.5142	88.58	.1721	.5212	89.41	.1736	.5280	90.25	.1751
80	.4434	89.61	.1717	.4496	90.46	.1733	.4556	91.31	.1747
90	.3840	90.61	.1714	.3895	91.48	.1729	.3949	92.35	.1744
100	.3339	91.58	.1711	.3389	92.48	.1726	.3437	93.37	.1741
120	.2550	93.44	.1706	.2591	94.38	.1721	.2630	95.32	.1737
140	.1969	95.14	.1700	.2003	96.14	.1716	.2037	97.12	.1732
160	.1531	96.64	.1695	.1562	97.72	.1711	.1591	98.76	.1727
180	.1196	97.87	.1687	.1225	99.04	.1704	.1251	100.16	.1721

(Continued next month)

Checklist for Cooling Towers

HORACE I. SCHMIDT
General Sales Manager, Halstead & Mitchell

MAINTENANCE of cooling towers is rather simple, but should be a regularly scheduled procedure. Depending on locality, they should be checked and cleaned once or twice a year. In particular:

Flush out sump. A hose connection near the inlet make-up water line is most valuable for this purpose.
Check water level in distributing pans. Pans are installed to eliminate extra pumping head required on spray type towers. Improper water distribution in pan will result in loss of capacity.
Check belt tension. Excessive tension on drive between motor and fan shaft will create overload conditions and cause motor and bearing failure.
Check Casing for rust. Although protected steel is used, frequently scratches occur in installation. Spots should be cleaned up and repainted.
Check decking for salt deposits. Salt deposits left by evaporation of water usually form only in the inlet air baffles. It increases resistance to air flow.

If your present installation is not performing adequately, the following might be investigated:

Insufficient water circulation. Globe valves should be replaced with gate valves for controlling flow, as the former has a high pressure drop through it.
Premature liming of condensers. Unless proper provision for bleed, or blowdown, is made, concentration of solids and acids in the closed water system will make trouble. Bleed is best taken off at the head of the pump by means of a small ¼-in. line and adjusting valve, and should amount to about 0.25% of total water circulated.
Recirculation of discharge air. Tower should face in the direction of the prevailing wind during the summer months, preventing recirculation of warm, moist air from the discharge to the inlet side.
Tower rusting and condenser liming. Both will be markedly reduced with water treatment. It is not always necessary, but cost of treatment is quickly returned through operaing efficiency and longer life.

Building-Forecast for 1957

New building is expected to total almost $29 billion in 1957, about 2% above the volume of more than $28 billion evident for 1956, according to outlook estimates prepared jointly by the Departments of Commerce and Labor.

The following table summarizes the production. Figures are in *millions of dollars:*

Type	1956	1957	% Change
New Residential	13,645	13,150	—3.6
Additions, alterations (res.)	1,385	1,500	8.3
Non-housekeeping dwellings	445	500	12.4
Industrial	3,485	3,625	4.0
Offices and warehouses	1,365	1,500	9.9
Stores, restaurants, garages	1,935	1,800	—7.0
Religious	775	875	12.9
Educational	3,095	3,400	9.9
Hospitals and institutions	630	775	23.0
Social and recreational	270	300	11.1
Other non-residential	1,295	1,500	15.8
Total	28,325	28,925	2.1

Construction costs are expected to continue to rise, but at a rate slightly lower than in 1956. Building materials generally should be in adequate supply, with no more than minor spot shortages likely, because of extensive gains in plant capacity and record production levels. Mortgage funds, however, will probably continue to be relatively scarce, especially for long-term, low down payment loans, reflecting widespread competition for credit to meet the unusually large demands of businesses, governmental units, and individual consumers in a record-breaking economy.

Prospects are that about a million new private nonfarm dwelling units will be started in 1957. This compares with an average annual rate (seasonally adjusted) of 1,100,000 for the first 10 months of 1956, and a 1955 total of 1,310,000. The still relatively high level of housing starts predicted for 1957, despite continuation of present mortgage financing problems, results in part from sustained consumer demand for better housing, backed by rising incomes; a large volume of retirements (demolished, abandoned, or converted units) from the housing supply; and a steadily increasing and highly mobile population.

Present indications are that private industrial plant construction will continue to expand in 1957, but at a much slower rate than during the past two years. The slower rate of expansion which is apparent from the declining level of contract awards in recent months, reflects in part the fulfillment of capacity goals in some industries, and some revision of expansion programs in others. The $3.6 billion expected to be put in place on industrial buildings in the coming year will be an alltime high, exceeding 1956 volume by 4%.

In commercial buildings, an increase for office buildings will offset a decline in expenditures for new stores and other mercantile buildings. Demand for additional office space is still high, as indicated by the continued low office-building vacancy rate. On the other hand, declining contract awards volume and the completion of many new shopping centers suggest that storebuilding demand is beginning to taper off.

Is It Better to Use a

Reciprocal or Centrifugal Compressor

For Maximum Performance?

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There is a place for both the reciprocating and centrifugal compressor. The author puts each in its place. Their performance characteristics are discussed to help in the most economical selection in various applications.

THE slow-speed operation of early machines dictated the development of the first slow-speed reciprocating compressor. As knowledge of mechanics expanded, reciprocating compressors increased in speed and more efficient design made possible a much desired reduction in size. Because of this development, most engineers thought that reciprocating compressors would always dominate the field.

Progress made in high speed rotative machinery, however, soon created the need for a refrigerant compressor with higher speed than was attainable with reciprocating design. It was then that the centrifugal refrigerant compressor became inevitable. Centrifugal compressors act like centrifugal fans and inherently produce smooth gas flow.

Early application of centrifugal compressors to the field of mechanical refrigeration made it obvious that this type of equipment afforded a saving in material and space. Further perfection indicated economies, comparable or superior to that of the reciprocating machine, particularly in the larger sizes.

Continued progress in development and design and improved refrigerants for use in centrifugal compressors have lowered their practical application limit to about 50 tons, with a rather sharp improvement in cost per ton and in performance at 75 tons. This progress has created some over-optimistic opinions in favor of the centrifugal machine, just as was true of the reciprocating compressor in its early history.

In light of the progress of both compressors, we must decide which type of equipment best fits various applications. Careful analysis will show that each has a field in which it is best suited and an amazingly small field of direct competition.

It can be reliably stated that reciprocating (and rotary) compressors completely dominate the field of 50-tons capacity and less. While centrifugal compressors perform acceptably at 50 tons, its particular characteristics best suit it for larger applications of 75 tons and over.

Not only the capacity divisions outlined above, but many other factors must be taken into account to meet the problems reliably and economically. Some of these factors are discussed in the following.

Condensing Temperature

Centrifugal compressors are best applied where condensing temperature is moderate and normally constant for a given machine. Once they are installed, condensing temperature can be permitted to rise only over a very narrow range because as soon as condensing temperature, which influences compression ratio, goes beyond the design range of the compressor, point R, capacity rapidly decreases. This is illustrated in Fig. 1. At point A, compressor quits pumping.

Where reciprocating compressors are used, condensing temperature can vary over a wide range without completely cutting off the refrigerating load. Change in condensing temperature will, however, affect compressor performance by changing its volumetric and over-all efficiency. This results in a reduction of capacity, as illustrated in Fig. 1, although it has no definite quitting point, as with the centrifugal compressor.

If a centrifugal compressor is used, therefore, available condensing water temperature must not exceed maximum design temperature. To be more conclusive, equipment must be designed for maximum condensing water temperature anticipated. When condensing water temperature is variable, and particularly if higher temperatures are somewhat unpredictable, reciprocating compressors will serve best. The only problems faced under these conditions are reduction in capacity and increased horsepower due to high condensing water temperatures. Lim-

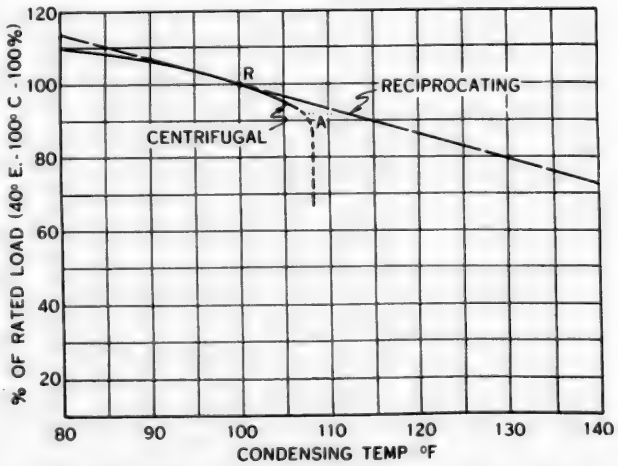

Fig. 1. Effect of condensing temperature on rated load.

iting factors which determine maximum compression ratios for reciprocating compressors are temperature rise and bearing loads.

Evaporator Temperature

Similar to limitations of condensing water temperature, centrifugal compressors face limitations at the evaporator end. They are more applicable where evaporator temperatures are moderate or reasonably constant for any given installation. Some exceptions can be made where low temperature evaporators of very high capacity must be operated. In such cases, application of several machines in series or machines hooked up in a cascade system will result in most economical installation, but requires special design considerations. Fig. 2 illustrates that evaporator temperature can be only moderately reduced from the design point (R), (constant condensing temperature assumed) before the limit is reached where capacity drops off rapidly. Point A is the approximate pumping limit. Where a highly variable evaporator temperature is anticipated, particularly on the low side, reciprocating compressors serve best.

A refrigerated railroad car is the outstanding case where highly variable evaporator temperatures may vary from —20 deg F to +40 deg. In meeting the requirements of variable suction conditions, reciprocating compressors require no special change in design. Any standard compressor will perform substantially in accordance with the curve as illustrated in Fig. 2.

Compression Ratio

Compression ratio is directly influenced by condensing temperature and evaporator temperature, noted above. It follows that compression ratio for centrifugal compressors is rather limited for any single unit. Maximum practical compression ratio for a single unit, about 4.5, is fixed when design and speed for any one machine is fixed. This is particularly true for the hermetic design where the speed is fixed and the practical limit for automatic installations is two-stage. With special engineering effort and consideration, variations from these limits are possible by larger diameter wheels.

With the use of high speeds (gear drive) and many

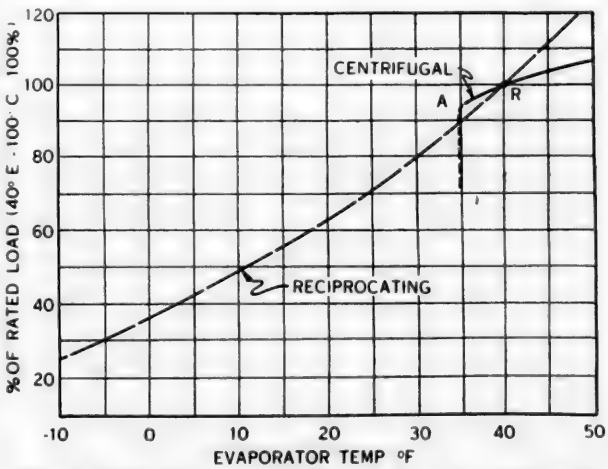

Fig. 2. Effect of evaporator temperature on rated load.

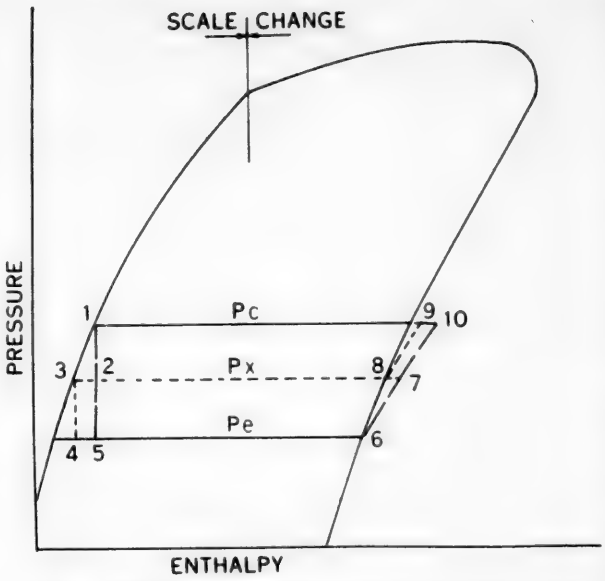

Fig. 3. Effect of intercooler as shown on p-h diagram.

stages, centrifugal compressors can be designed for higher compression ratios. Because of these special design requirements, they are most practical on large, special jobs.

Where a highly variable compression ratio is needed, reciprocating compressors must be used. For any one machine, it is practical to operate at any compression ratio up to about 10 to 1. Maximum economy may dictate multi-staging with compression ratios above 7. On such applications as refrigerated cars, higher compression ratios are used because multi-staging is impractical.

General application problems outlined above dictate the choice of compressors to be used. Centrifugal compressors can be designed for a wider range of conditions than are noted in Fig. 1 and 2, but only at a sacrifice of efficiency.

Some other characteristics involved in the performance of the machines, but less decisive are as follows.

Intercoolers (Economizers)

Intercoolers can be used on single machine centrifugal-compressor installations with two or more stages, thus boosting economical performance. Fundamentals of the economizer are best illustrated by the pressure-enthalpy diagram, Fig. 3, where P_c is condenser pressure, P_e is evaporator pressure, and P_x is the economizer or interstage pressure. The normal single stage cycle is 1-5-6-10-1, with H_6-H_5 representing the refrigerating effect.

This is equivalent to single stage performance and could also represent the performance of a single stage (one wheel) centrifugal compressor. If a centrifugal compressor has two wheels, it is possible to throttle the liquid down in two steps with the pressure between these two steps equal to the pressure between the two wheels. Thus the flash gas at this point can be introduced at the suction of the second stage wheel. The performance would then be similar to a two stage refrigeration cycle.

With economizer, the two-stage cycle is 1-2-3-4-6-7-8-9-1, H_6-H_4 representing the refrigerating effect. De-

pending upon conditions and details of economizer design, point 8 may or may not be on the saturation line. For convenience, it is shown on the saturation line. The major gain from the economizer is that each pound of refrigerant through the evaporator gains (H_5-H_4) in refrigerating effect. Other economizer performance features may be shown.*

In addition to increasing efficiency, application of an economizer increases compressor capacity or permits use of smaller compressors for the same load. Economizers can only be used on reciprocating compressor applications where two or more compressors are used in series, or where multi-stage compressors are used.

Mechanical Performance

Having only rotating parts, centrifugal compressors usually afford the smoothest and quietest operation, especially hermetic centrifugal compressors. Modern design has greatly increased the degree of smoothness and quietness of reciprocating compressor units, but for comparable capacity they cannot fully compete with well-designed centrifugal compressor units.

Capacity Control

Without capacity control, centrifugal compressors can be varied down to about 50% load before the pumping limit is reached. With vane control at all stages, it is possible to provide a modulating control from about 10% to maximum.

Unless cylinder unloaders are provided, reciprocating compressors will operate at relatively constant loads. Cylinder unloaders make it possible to vary control capacity in a number of steps equal to the number of cylinders. For cooling effect, at least one cylinder must be maintained at full load whenever compressor is in operation.

Starting Load

Always starting at zero load, centrifugal compressors may go beyond full horsepower as speed is increased, due to high evaporator pressure at start-up, unless vane controls are provided to reduce this load. Reciprocating compressors will start fully loaded unless provided with cylinder unloaders, which start the compressor with all cylinders unloaded, permitting the use of normal torque motors. Otherwise, high starting-torque motors must be used.

Purge Pump

A purge pump, required because all normal centrifugal applications operate below atmospheric pressures in some portions of their cycle, maintains a low level of non-condensables in the system in order to maintain efficient performance. It is not required for reciprocating compressors because pressures involved are usually above atmospheric.

*(1) Assume W equals weight of refrigerant through evaporator.
(2) Refrigerant compressed in first stage = W.

(3) Refrigerant circuiting second stage only = $W\left(\frac{H_2 - H_3}{H_3 - H_2}\right)$

(4) Refrigerant compressed in second stage =

$$W\left[1 + \left(\frac{H_2 - H_3}{H_3 - H_2}\right)\right]$$

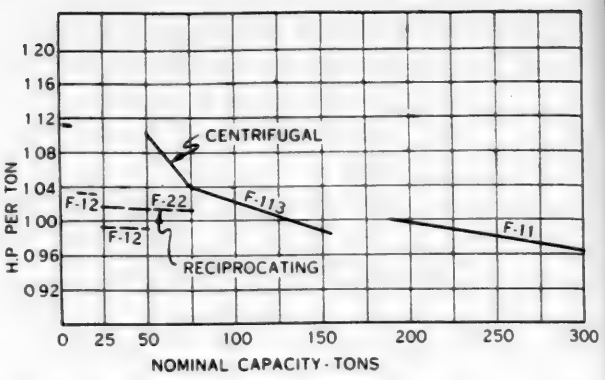

Fig. 4. Relative performance of reciprocating as compared to centrifugal compressors.

Service and Maintenance

Service and maintenance requirements of centrifugal compressors, particularly of hermetic design, are negligible. This is due to the fact that hermetic design has only one moving part with two bearings and affords a very simple lubricating system.

Reciprocating compressors have a multiplicity of moving parts, including automatic spring-loaded valves which require more complex lubricating systems. This tends to increase the problem of service and maintenance. However, recent improvements in design and surface treating of materials have greatly reduced service and maintenance requirements.

Efficiency

Centrifugal compressors perform with acceptable efficiency at 50 tons capacity, are reasonably good at 75 tons and are excellent for larger machines. See Fig. 4. hp per ton vs. compressor size. Reciprocating compressors reach maximum efficiency at about 50 tons. For larger installations where reciprocating compressors are required or desired, the same efficiency can be realized by installation of multiple compressors.

Conclusion

From the above information, note that each type of compressor design has its field, and general conclusions can be drawn as follows: Centrifugal compressors serve the purpose most economically where design load is 75 tons or over and compression ratio is reasonably constant, not in excess of 4.5. These limitations dictate relatively constant evaporator temperature and condensing temperature. Reciprocating compressors best serve the purpose for all applications where compression ratios may be high or highly variable, or for normal air conditioning applications where the load is 50 tons or less.

For special applications where considerable engineering effort is warranted, it is essential to weigh all factors carefully in reaching a decision.

AIR CONDITIONING, HEATING AND VENTILATING'S

Reference Section

Air Conditioning the Hospital

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Mechanical Engineer, Division of Hospital and Medical Facilities,
Public Health Service, Washington, D. C.

Design data and general information regarding the control of temperature, humidity and air sanitation for hospitals

AIR CONDITIONING, HEATING AND VENTILATING — JANUARY, 1957

Air Conditioning the Hospital

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Personal comfort is the motive, in most cases, for installation of air conditioning systems. However, in hospitals, important factors are its therapeutic value, air sanitation, and the welfare of hospital patients. Each part of the hospital presents special design problems as regards temperature, humidity and air circulation which must be understood. Suggested design conditions are presented, as well as a discussion of the various systems that should be considered. In this article, air conditioning refers to the simultaneous control of temperature, humidity, air movement and cleanliness of air to provide a constant optimum condition within the hospital, regardless of the season of the year. Supplementary information is included.

HOSPITAL air conditioning presents problems that are not usually encountered in ordinary comfort conditioning systems. Other than the hospital staff, the clientele served are often physically debiliated with a lowered resistance to infection and this necessitates certain safeguards for their protection.

Although the outdoor air supply to hospitals may be relatively free of pathogenic contamination, it may become more contaminated after entering the hospital. Therefore, it is desirable that the system be designed to limit the circulation of air from area to area and from patient room to patient room, insofar as is practical.

It is impossible to prescribe a particular system which would be suitable for all hospitals for the design of the hospital air conditioning system will vary according to the size, type and layout of the structure, space allotments, orientation, climatic conditions and many other factors.

Limited Systems

Due to climatic conditions, many hospitals will require the cooling cycle for selected areas only, such as operating and delivery rooms, recovery rooms, special treatment rooms, nurseries, and obstetrical nursing areas. Such requirements will probably be best served by factory assembled units located outside of the area, utilizing conventional duct systems for air transmission.

Total Systems

The designer planning an over-all air conditioning system for the hospital has a wide variety of designs to consider including low and high pressure central systems adaptable to many modifications, as well as many types of individual room unit systems.

High pressure systems, which are coming into more general use, have certain advantages over conventional low pressure systems in that they require smaller duct systems and less elaborate central circuiting. The smaller ducts may reduce building cubage requirements and minimizes interference with the many concealed utility lines during construction. They lend themselves to a great variety of control arrangements. These advantages may in some cases be offset by the more expensive auxiliaries required. A combination high and low system may offer the greatest advantage in some instances.

There are many variations of the high and low pressure systems, and some are covered in the following paragraph.

Central Fan and Duct System

This type system serves the entire hospital. It concentrates all equipment, fans, coils, sprays, and filters in one location. While adaptable to the small hospital, it does not provide the flexibility or control generally necessary to serve the many areas of a large hospital. This type system may be designed for either high or low pressure service.

Individual Factory Assembled Units

These are units of large capacity and a system designed for their use may require one or more units. Each unit consists of a fan, coil, and filter. The coils are served by remotely located refrigeration and heating equipment. These units may be located on each floor or one unit may serve several floors. This type system may be either the high or low pressure type and may be further modified by the following:

1. Zoning to provide better control of varying load conditions.
2. Installations of reheat coils in zone ducts for better temperature regulation of zones.
3. Installation of reheat coils in the various individual room branch ducts for room temperature control.
4. A double duct system, one duct carrying cooled air and the other warmed air. At the individual room outlet, the air is mixed for precise temperature regulation regardless of variations or changes in thermal loads in any part of the building.

With systems of this type, air distribution in the con-

ditioned areas is generally by means of window sill, wall, or ceiling mounted diffusers. Window sill or ceiling diffusers may be of the conventional air delivery type or the aspirating type.

High Pressure Induction Type Convector System

This system, sometimes referred to as a perimeter system, consists of individual units in each room. Units contain a coil served by remotely located central refrigeration and heating systems. Primary air, usually fresh air, is conditioned at a central point or at individual floor units to compensate for latent heat gain in summer and latent heat loss in winter. This primary air is delivered to the room unit at high velocity and in passing through the unit induces a flow of room air over the unit coil compensating for sensible heat gain or loss within the area depending upon the season. The induction ratio is usually about 4 to 1. Where the structure has interior areas removed somewhat from the perimeter, which have different or varying load characteristics, a separate system or zone may be required. The individual unit coils will require seasonal cleaning.

Temperatures are controlled by throttling the water supply to the coils.

Low Pressure Induction Type Convector System

This system is similar to the high pressure type but varies in that the individual room unit performs only a heating and reheating function. All primary air is cooled and dehumidified through a central system or individual floor systems and carried by duct to the individual unit. Room temperatures are usually controlled by throttling the air supply through the unit. Heating coils may be sized to provide, by thermal circulation, minimum temperatures when the primary air supply is not operating. In areas requiring a definite ventilation rate, a by-pass may be necessary to provide primary air volume.

Richard P. Gaulin received his engineering education at Pennsylvania State University. He served as sales engineer with a number of manufacturers of heating equipment. He was design mechanical engineer with the Public Buildings Administration and mechanical maintenance engineer in the Operations Branch of the Federal Public Housing Authority. Since February, 1949, Mr. Gaulin has been mechanical engineer with the Public Health Service, Division of Hospital and Medical Facilities. He is a member of ASHAE and represents that society on the NFPA Committee on Hospital Operating Rooms.

Individual Room Units

These units are located on the outside walls usually under windows with a small opening through the wall to provide outside air. Each unit contains a fan, coil, filter, and motor. Chilled or heated water from a remote source is circulated through the coil in the unit for cooling or heating. These units have the advantage of not requiring a duct system but the disadvantage of no positive ventilation and poor control between seasons.

Window Cooling Units

These units are not recommended for new buildings

1. Desk
2. Filing cabinet
3. Microscope table, 30 inches high, with cabinets and slide drawers below
4. Cup sink with gooseneck spout
5. Microscope
6. Analytical balance with weights
7. Acid resisting counter, 36 inches high
8. Cabinets below counter
9. Wall cabinets
10. Book shelves
11. Acid resisting laboratory sink with gooseneck spout
12. Air, gas and electric outlets
13. Single element hot plate
14. Bunsen burner
15. Acid resisting laboratory sink with peg boards
16. Chemistry table
17. Straight chair
18. Stool
19. Sanitary waste receptacle
20. Closet
21. Wheel cart for frozen sections
22. Laboratory autoclave, 17½ x 26 inches
23. Hot air sterilizer, 24 x 14 x 14 inches
24. Incubator, 18 x 18 x 27 inches
25. Water bath
26. Centrifuge
27. Shaking machine on stand
28. Waste paper receptacle
29. Refrigerator, 8 cubic feet
30. Refrigerator, 6 cubic feet
31. Bedside table
32. Shelves over chemistry table
33. Hospital bed
34. Cubicle curtain rod and curtain
35. Basal metabolism apparatus
36. Electrocardiograph apparatus
37. Hook strip
38. Table, 24 x 36 inches
39. Shelving
40. Sliding window curtain
41. Adult scale

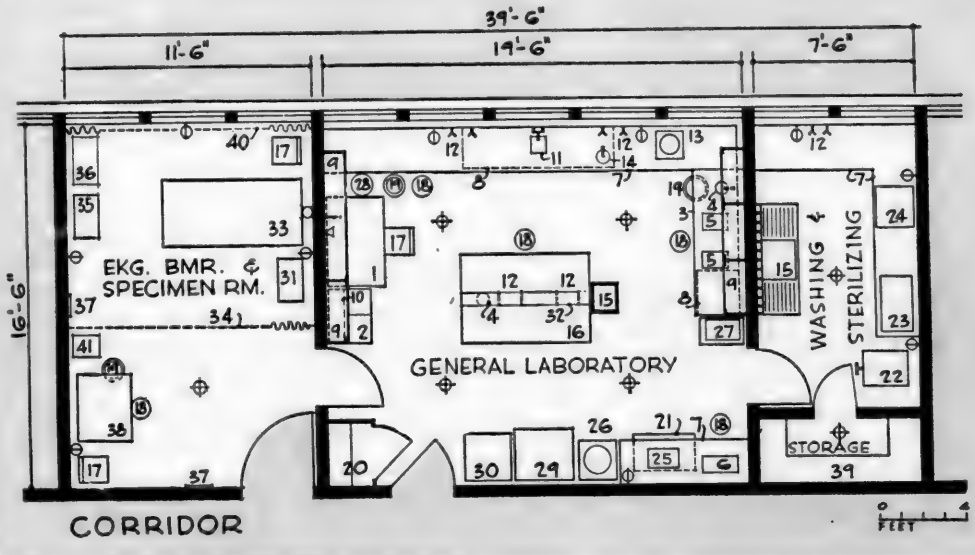


Fig. 1. Layout of a laboratory to serve a 100-bed hospital.

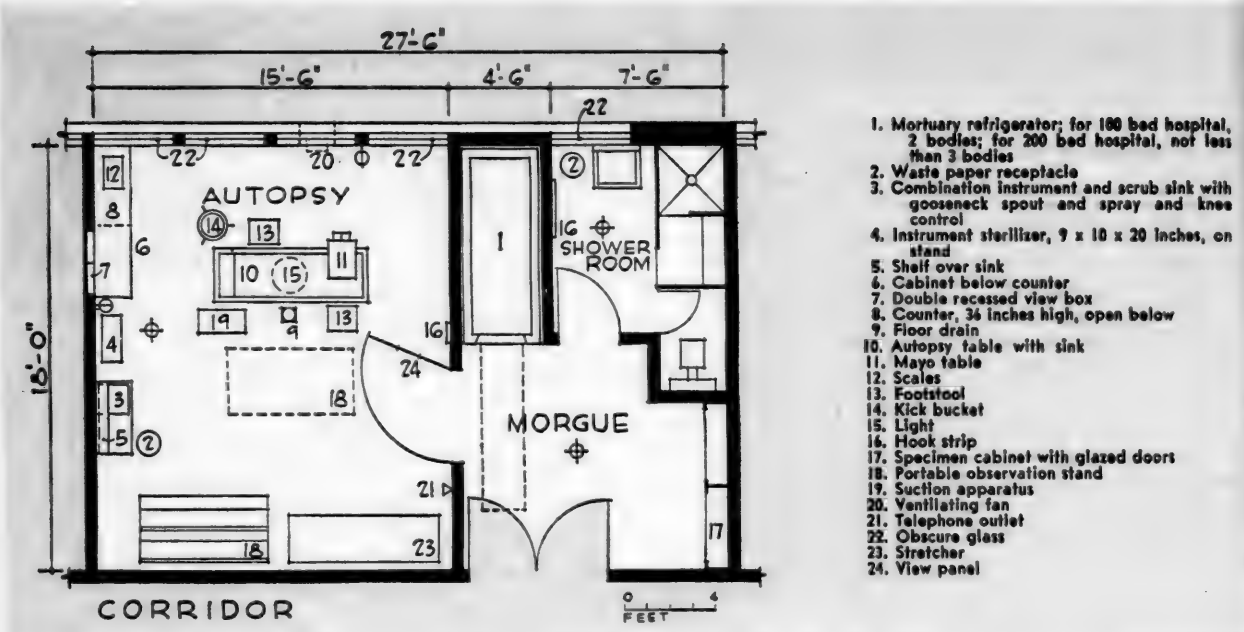


Fig. 2. Morgue and autopsy suite for a 100 or 200-bed hospital.

because of noise, drafts, poor temperature regulation, and maintenance and service problems resulting from the many individual pieces of equipment. Such units have been used to some extent for installation in existing buildings.

Handling Ventilation Air

Systems discussed are to be considered as basic and they do not include all systems or variation of systems which may be adapted to hospital use. Systems which operate on the principle of induction or aspiration and which provide approximately 20% ventilation air with 80% recirculation of room air, lend themselves nicely to minimizing the recirculation of air between patient rooms. Using such systems, the corridor serving patient rooms is pressurized with the small amount of air necessary for corridor ventilation. Corridor air is exhausted through all rooms opening on to the corridor. Patient room air in an amount equivalent to primary induction air plus some corridor ventilation air is exhausted through the patient's room toilet or through a similar exhaust system.

Often financial, structural, or other considerations will dictate the use of a design which recirculates the air of a patient area through the central conditioning system and redistributes it to patient rooms. Individual factory-assembled conditioning units with efficient filters in the recirculating system are recommended to confine this recirculation to a limited area such as a nursing unit or floor. Such a system should reduce the hazards of cross infection to a minimum in general medical and surgical nursing units.

The corridors of patient areas should not be used as exhaust air plenums. Such circulation is contrary to most fire safety codes and is not considered desirable for ambulatory patients or personnel who will traverse the corridors.

Design Criteria

Special phases of engineering fundamentals and construction peculiar to hospitals and of interest to hospital architects and engineers will now be considered by departments or facilities.

It should be noted that air change rates as specified for specific areas refer to outside air requirements for ventilation and in no way reflect air turnover required for the conditioning process.

For design purposes, the acute general hospital may be divided into its principal service areas. These will vary somewhat from each other in the design treatment which their function will require. These areas are: Administration department, diagnostic and treatment facilities, nursing department, nursery, surgical department, obstetrical department, emergency department, and service department.

Administration Department. This department, consisting of lobby and waiting rooms, offices, library and conference room, record room and toilets, will require no special ventilation treatment. General recirculation of air within the administration area, excepting toilets, would be indicated.

Diagnostic and Treatment Facilities. These facilities, some of which require special study, are: Laboratory, radiology, physical therapy, occupational therapy, and pharmacy.

Laboratory. The laboratory, Fig. 1, depending upon the size of the hospital, may consist of one or several rooms in which are performed functions relating to bacteriology, pathology, serology, chemistry, hematology, and urinalysis.

While odor control in all of the laboratories should not be overlooked, only the bacteriology section and certain areas of pathology will require special attention relative to ventilation. Up to 75% of general laboratory air may

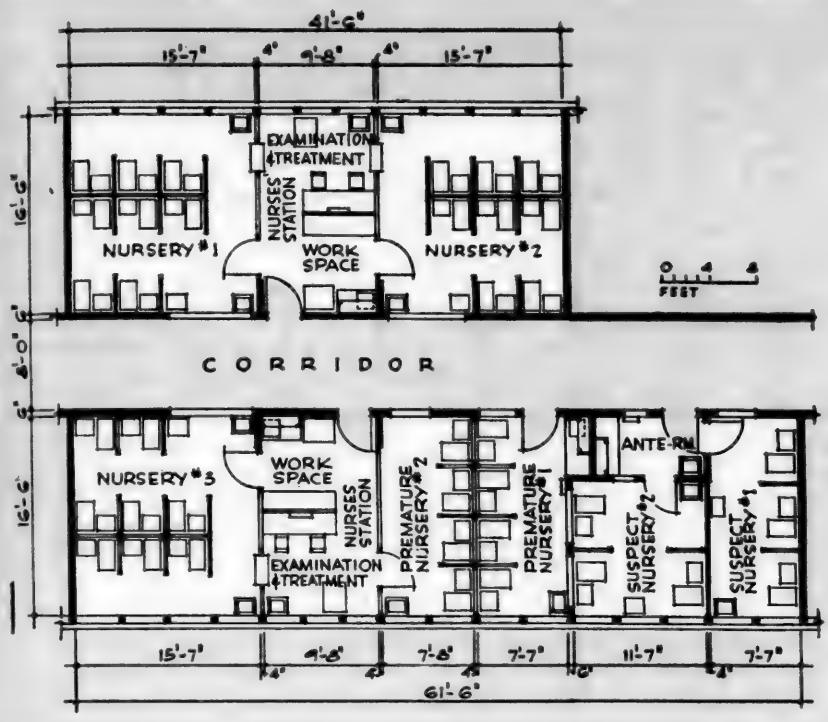


Fig. 3. Layout of a nursery to serve a 200-bed general hospital. All plans in article courtesy of Division of Hospital Facilities.

be recirculated if properly filtered except that all air of virus or infectious disease laboratories should be exhausted to the outside.

Chemical fume hoods with integral ventilation systems designed to void the hood and protect the personnel, will be installed in the laboratory area. Consideration should be given to hood exhaust capacities in computing general air supply and exhaust to the area. Hoods should be connected by non-corrosive vent lines through the roof and acid resisting fans should be used. It is preferable to place the hood exhaust fan on the roof to prevent the possibility of acid fumes being forced into the building.

Bacteriology

As undue air movement is not desirable in the area devoted to bacteriology, care should be exercisd to limit air velocities to a minimum. A ventilation rate of 10 air changes per hour is recommended for the area with a negative air pressure.

The Sterile Transfer Room, within or adjoining the bacteriology laboratory, is a room where sterile media is distributed and where some types of specimens may be transferred to culture media. The air supplied to this room must be filtered at the point of entry to the room and velocities at working level should not exceed 25 fpm. A glass fiber filter with 99% efficiency, preceded by a dust stop, is recommended.

The Media Room, essentially a kitchen, should be ventilated to remove odors and steam.

The infectious disease (particularly tuberculosis) and virus laboratories of large institutions will require special treatment. To protect the personnel, such laboratories will require ventilation at a rate of 10 air changes per hour with no recirculation. A negative pressure within the area should be established to prevent the spread of the organisms through the movement of air from room to room or to adjoining areas. Area supply and exhaust fans should be electrically interlocked so that the supply will shut off if the exhaust fails, but not the reverse. As protection for personnel, air should be exhausted at points as close to work areas as possible. The entire exhaust from the virus or infectious disease laboratories may be taken from slots or similar openings just above the work counters and from hoods.

Bacteriological Hood

Where the nature of the laboratory procedures with infectious microorganisms is such that a ventilated bacteriological hood or safety cabinet is provided, effective sterilization of the outboard exhaust is required. This may be accomplished by the use of electric or gas-fired heaters designed to heat the air to 600 deg F. Some authorities recommend the installation of glass fiber filters in series with the electric or gas-fired heater to insure against an interruption of work in the event the heater fails for any reason.

In many instances, only glass fiber filters are necessary and, in this case, an integral electric heater element may be provided as a source of 400 deg F heat for dry sterilization of the filter media prior to changing filters, as a protection for maintenance personnel.

Pathology

Areas of the pathology section which will require special attention are the autopsy room and, in larger hospitals, the animal quarters.

Autopsy Room. The autopsy room, Fig. 2 will require a minimum of 10 air changes per hour, with no recircula-

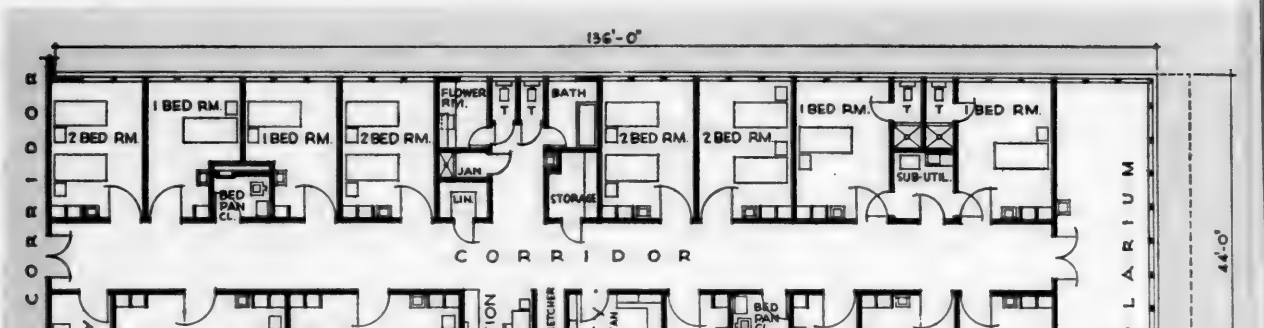


Fig. 4. A 25-bed nursing unit having east and west exposure.

tion and a mechanical exhaust system which will discharge the air above the hospital roof. A negative air pressure is indicated for this room. Where the autopsy room will not be in constant use, it may be desirable to provide local control of the ventilation.

Animal Quarters. The animal room will require 15 air changes per hour with no recirculation and a mechanical exhaust system which will discharge the contaminated air above the hospital roof. Depending upon the type of work performed in the animal quarters, sterilization of outboard exhaust similar to that recommended for infectious disease laboratories may be required. In larger hospitals where the exhaust air from the animal quarters may be carried in a duct system common to the laboratories, throw-away dust stop filters are installed at the animal room exhaust grilles to prevent animal hair from entering the main exhaust system. Air diffusion to avoid drafts is of particular importance in the animal quarters. Temperatures of 75 to 80 deg with relative humidities of 40 to 50% are usually required.

Radiology

In the radiology department, the fluoroscopic, radiographic, therapy, and dark rooms will require special attention. Among conditions which make positive ventilation mandatory in these areas are the odorous characteristics of certain clinical conditions treated, special construction designed to prevent ray leakage, and light-proof window shades which reduce any natural infiltration to the fluoroscopic area.

A positive ventilation rate of 3 air changes per hour with temperatures up to 80 deg and 40 to 50% relative humidity should be provided for fluoroscopic, radiographic, and deep therapy rooms.

Depending upon the location of air supply and air exhaust louvers, lead lining may be required in supply and return ducts at the points of entry to the deep therapy treatment area to prevent ray leakage to other areas.

The dark room will require 8 air changes per hour. Exhaust from the dark room and the film dryer in it are usually discharged directly to the outside. Because of the intermittent use of this room in small hospitals, local control of the exhaust may be desirable.

Physical Therapy

One or more rooms in the department of physical therapy may be assigned to electrotherapy, hydrotherapy, and exercise.

The cooling load of the electrotherapy section will be affected by the short wave diathermy, infrared, and ultraviolet equipment used in this area.

The hydrotherapy section with its various water treatment baths will generally be maintained at temperatures up to 80 deg. The potential latent heat build-up of this area should not be overlooked.

As a protection against condensation, exhaust ducts from large hydrotherapy areas may require soldered joints or be otherwise watertight and should be graded and dipped to an open drain.

The exercise section utilizing posture mirrors, bars, steps, ramps, ladders, and other equipment will require no special treatment.

Generally, the recirculation of air of the physical therapy department is permissible and temperatures and humidities within the comfort range are recommended for this area.

Occupational Therapy

In this department the space for activities such as weaving, braiding, art work and sewing will require no special ventilation treatment. Recirculation of air for this department is permissible.

Larger hospitals or those specializing in rehabilitation will have a greater diversification of skills and crafts such as carpentry, metal work, plastics, photography, ceramics, painting and finishing of projects. Such a department will require specific study of the ventilating problem.

Pharmacy

This area will be treated for comfort and will require no special ventilation.

Nursery Area

The nursery area will usually consist of a full-term nursery, a premature nursery, an observation nursery, work space, and an examination room. See Fig. 3.

Full-Term Nursery. A temperature of 75 deg. and a relative humidity of 50% are recommended for the full-term nursery, examination room and work space. It is necessary that similar conditions be maintained in all of these areas as care of the full-term infant requires that they be moved periodically from the nursery to the work space and examination room. The maternity nursing section should be treated similarly to protect the infant against temperature changes during visits with the mother.

Premature Nursery. The premature nursery will require temperatures of 80 deg and a relative humidity range of from 55 to 65%. Although it will be equipped with individual incubators which provide close regulation of temperature and humidities, these conditions must be maintained in the area to accommodate the infant who is removed from the incubator.

Observation Nursery. The observation nursery (also known as suspect nursery) is a room set aside from the full term nursery for the observation of full term infants who have developed unusual clinical symptoms. This nursery will require a temperature of 75 deg and 50% relative humidity. The air of the observation nursery should not be recirculated.

Ventilation of Nurseries

In order to provide maximum safety for the newborn, whose resistance to infection is normally low, the following conditions should be adhered to:

1. The entire nursery should be pressurized to prevent the entry of contaminated air from outside areas.
2. An equivalent of 3 air changes per hour of outdoor air should be supplied.
3. Nursery air, with the exception of the observation nursery, may be recirculated within the nursery when properly filtered.
4. Air from the observation nursery should not be recirculated; it should be discharged to the outside.
5. Air distribution within the area should be carefully planned, and air velocities at floor level should not exceed 25 feet per minute.
6. Air from other areas of the hospital shall not be circulated through the nurseries under any circumstances.

Nursing Department

This department, Fig. 4, will include all or most of the following rooms: Patient rooms, isolation unit, psychiatric room, treatment room, nurses' station, utility room, floor pantry, solarium, flower room, toilet, bedpan closet, and bathroom.

Patient Rooms. Because of the ever present possibility of cross-infection particularly of the respiratory tract, and to prevent the spread of odors, it is desirable that air circulation be confined to the individual rooms of this area. However, patient room air may be recirculated through a central conditioning system and be redistributed to the patient rooms with an acceptable degree of safety if properly filtered. A temperature of 75 deg and relative humidity of 45 to 50% are recommended for all rooms of this area.

A minimum ventilation rate of 1½ air changes per hour is recommended for patient rooms. The ventilation of toilets, bedpan closets, and all interior rooms and bathrooms should conform to local codes.

Isolation Unit. The isolation unit air exhaust system should provide for outboard exhaust of all air when the area is used for contagious disease or odorous cases and for recirculation of air when not used for this purpose. A minimum ventilation rate of 3 air changes per hour with a negative air pressure is indicated for this area. Room unit conditions which induce a flow of air through the unit are not recommended for this area because of the necessity for the periodic decontamination of coils.

Treatment Rooms: The treatment room may require special ventilation depending upon the nursing area specialty or type of work to be performed in the room. Usual practice will require 4 air changes per hour with temperatures up to 80 deg.

Floor Pantry. The ventilation requirements of this area will depend upon the type of food service adopted by the hospital. Where bulk food is dispensed and dishwashing facilities are provided in the pantry, the use of hoods with exhaust to the outside is recommended. Small pantries used for in-between-meal feedings will require no special ventilation. A negative pressure in the area will reduce the spread of odors.

Surgical Department

This department, Fig. 5, will usually include many or all of the following rooms: Major operating rooms, minor operating rooms, cystoscopic room, anesthesia induction room, recovery room, scrub-up alcove, substerilizing room, central sterilizing and supply room, instrument room, clean-up room, storage closet, stretcher space, janitor closet, surgical supervisor's space, doctors' locker room, nurses' locker room, fracture room darkroom, and anesthesia storage.

The operating rooms, including cystoscopic, fracture, and induction rooms, will require careful design to reduce the hazards of infection and explosion.

Operating Rooms. It is the opinion of some authorities that one of the most dangerous potential sources of surgical infection is the pathogenic bacteria given off from the noses and throats of the occupants of the modern well-run operating rooms. Air disinfection to remove or destroy this source of infection is generally accomplished by ventilation and in some cases by bactericidal irradiation.

Ventilation of the operating rooms as a dilutant or medium for the removal of organisms is the generally accepted installation in modern hospital practice. This practice, as a means of reducing surgical infections, has some substantiation by reports of studies of the subject. Ventilation is accomplished by introducing 100% of filtered outdoor air, preferably taken from above the roof, to the operating room at a rate of 8 to 12 air changes per hour with 10 air changes recom-

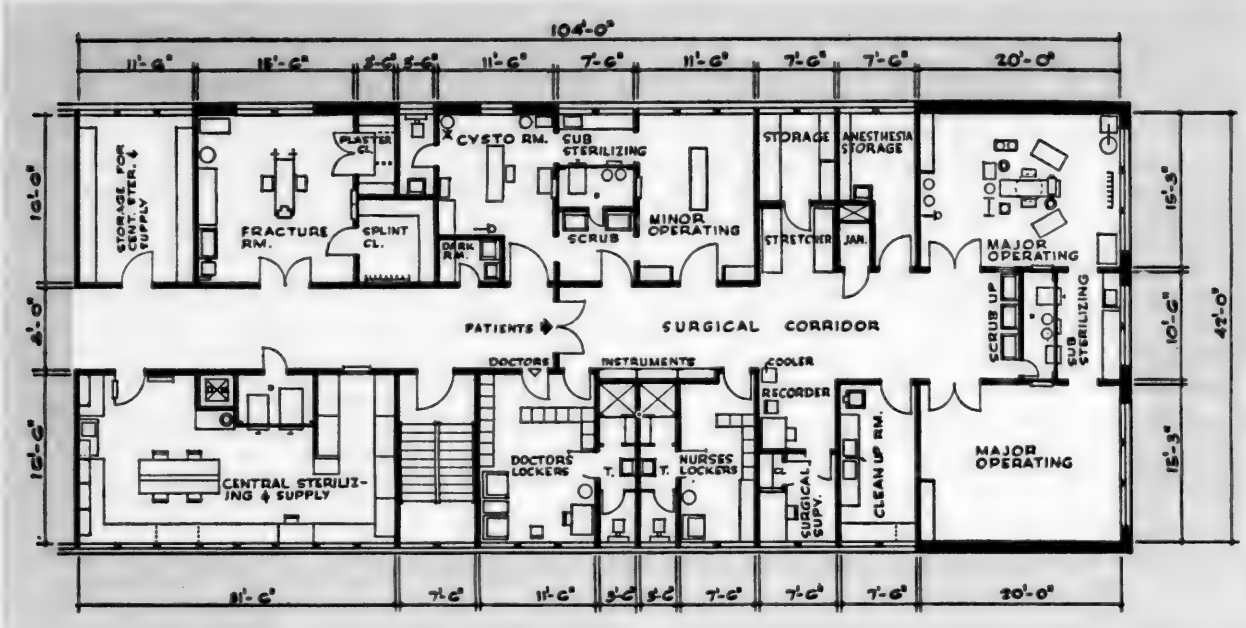


Fig. 5. Plan of an operating suite for a 100-bed general hospital.

mended. This ventilation rate also reduces the concentration of anesthetic gases thus diminishing the possibilities of explosions and providing a more agreeable atmosphere for the operating team.

At the present time there is some feeling among certain authorities that the recirculation of a portion of the air of the operaing rooms does no constitute a hazard to the patient. No reports of investigations as to the cumulative effect of recirculation on the bacterial concentration in operating rooms have come to our attention. Until such time as investigations prove otherwise, it is considered to be in the best interest of the patient to provide 100% fresh air with no recirculation.

Although very dramatic results relative to air disinfection of operating rooms by irradiation have been reported, this method of disinfection has not been generally applied. The reluctance to use irradiation may be accounted for by such factors as special designs required for installation, protective measures necessary for patients and personnel, constant vigilance relative to lamp output, and the maintenance required.

The following conditions are recommended for operating cystoscopic and fracture rooms:

1. Temperature of from 72 to 76 deg as required by the surgeon.
2. Relative humidity of 55% to reduce the hazard of static spark.
3. Ten air changes per hour.
4. One hundred per cent fresh filtered air.
5. No recirculation of operating room air during the time operating rooms are in use.
6. A positive pressure within the operating room to prohibit the entry of air from the corridor or other unsterile areas.
7. Exhaust air taken off from a point near the floor in order to remove dust and the heavy anesthetic gases.
8. Installation to conform to that portion of NFPA bulletin No. 56, "Safe Practices for Hospital Operating Rooms," which pertains to explosion hazards in hospitals.

In order to provide the maximum safety for the patient and to conform to these recommendations, a separate system will be required to serve the operating rooms. The system may be designed to permit recirculation of air during periods when the operating rooms are not in use. Controls governing recirculation of the air should be conveniently located so as to be available to the surgical supervisor at all times; in addition, a visual signal indicating whether the system is recirculating or not should be prominently located.

Recovery Rooms. Recovery rooms used in conjunction with operating rooms should provide approximately the same temperature and humidity as the operating rooms so that the patient will not be subjected to any radical change in environment during immediate postoperative recuperation. As anesthesia gas and nausea resulting from anesthesia sometimes create an odor problem in recovery rooms, a ventilation rate of 3 air changes per hour is recommended. The air of the recovery rooms may be recirculated if this air is properly filtered.

Anesthesia Storage. The anesthesia storage room should be ventilated at a rate of two air changes per hour to conform to the regulations set down in NFPA No. 56, "Recommended Safe Practice for Hospital Operating Rooms."

Central Sterilizing and Supply

The central sterilizing and supply rooms present no particular problem and comfort requirements of personnel are the prime consideration.

The following items are of importance:

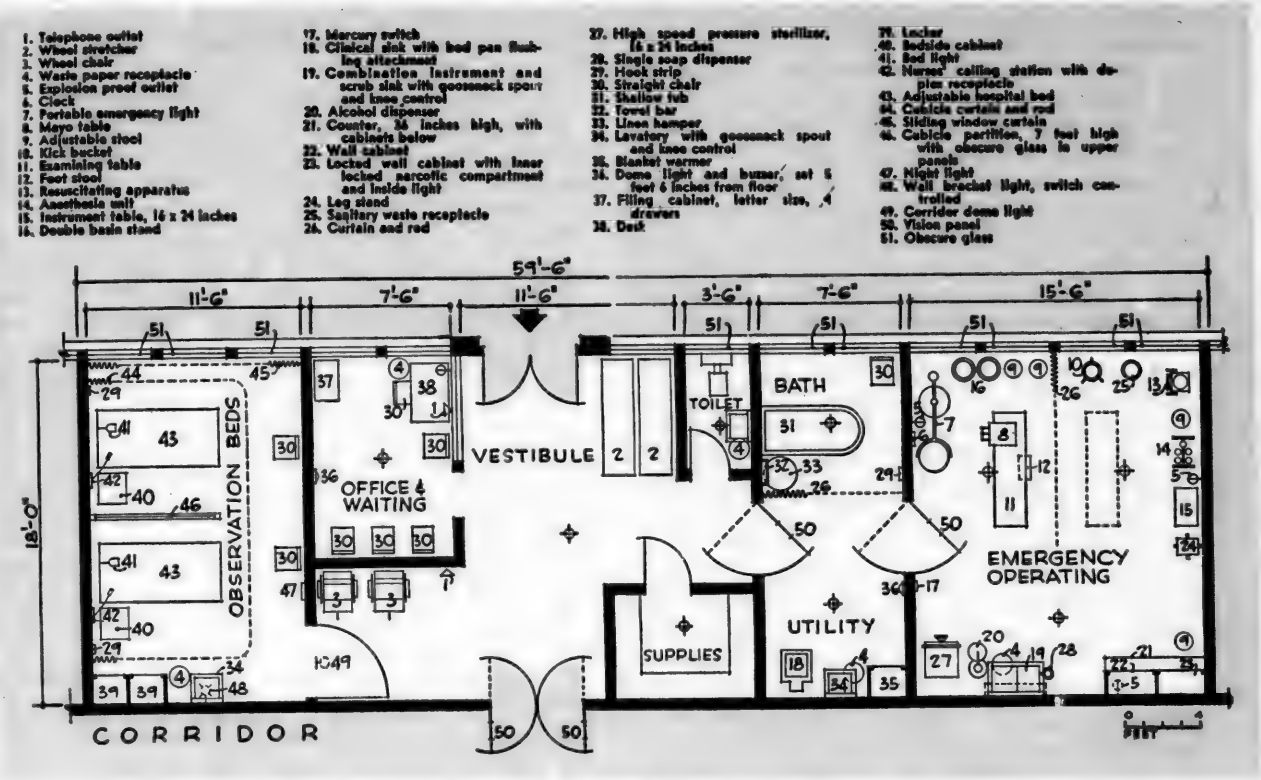


Fig. 6. Plan of a large emergency suite with location of appliances and equipment.

1. The insulation of sterilizers in these areas will materially reduce the heat load.
2. Sterilizer equipment closets should be amply ventilated to remove excess heat.
3. Air exhaust grilles or hoods, located immediately above sterilizer doors, will assist in voiding excess heat and steam and will protect wall and ceiling finishes.

Obstetrical Department

This department will include some or all of the following rooms: Delivery rooms, labor rooms, scrub-up alcove, substerilizing room, clean-up room, doctors' lounge, nurses' locker room, nurses' station, non-sterile storage, sterile storage, stretcher storage, and janitors' closet. See Fig. 6.

The system design for this department should be patterned after that of the surgical department. The recommendations for operating rooms will apply to delivery rooms.

Emergency Department. This department, Fig. 6, will usually consist of: Emergency operating rooms, toilet, storage and supply closet, and stretcher and wheelchair closet. In addition, larger hospitals will have: Office and waiting room, utility room, bath, and observation beds. The emergency operating rooms should be treated the same as the operating rooms in surgery. Observation bed space should conform to the requirements of patient rooms in the hospital. Office and waiting rooms will be treated for comfort.

Service Department

This department will include: dietary, housekeeping, mechanical, and employees' facilities.

These areas with the exception of employees' facilities are not usually cooled, but adequate ventilation is important to provide sanitation and a wholesome environment. Ventilation of these areas cannot be limited to exhaust systems only; provision for supply air must be incorporated in the design. The best designed exhaust system may prove very ineffective with an inadequate air supply and experience has shown reliance on open windows results only in dissatisfaction during the heating season. The incorporation of air to air heat exchangers in the general ventilation system, other than range hood exhaust, offers possibilities for economical operation in these areas.

Dietary Facilities

In this area the main kitchen, bakery, dietitians' office, dishwashing room, and dining space will require care in design.

Kitchen. The ventilation should conform to local codes, but in the absence of such codes, a minimum of 10 air changes per hour is recommended.

Cooking equipment such as broilers, ovens, ranges, kettles, and steamers are generally grouped for efficient utilization. The area serving this equipment should be vented through a hood to remove heat, odor, and vapors. The ventilation rate through the hood will vary according to design and mounting height, but a rate of 100 cfm

per square foot of hood opening is very often used with conventional hoods, mounted 6.5 ft. from the floor. Hoods over cooking equipment should be equipped with grease filters to remove any grease from the vapors before they enter the duct system. Condensed greases in duct systems are a potential fire hazard. Safety measures should be incorporated in the design to protect the duct system against fires originating over the stove. Such protection is usually accomplished by one or more of the following: A steam line to the throat of the hood at the duct connection for smothering action, CO_2 outlets at the hood perimeter, or fusible link dampers. The hood exhaust fan should be selected to provide the air volume required over the range of filter resistances. These resistances will increase greatly as the filters become fouled. The location of the system air supply inlets relative to hood exhaust is important to eliminate the possibilty of short circuiting between supply and exhaust. Where dietary facilities are located within the hospital structure, exhaust ventilating air should be dscharged above the roof.

Dietitians' Office. This office is very often located within the main kitchen or immediately adjacent to it. It is usually completely enclosed to insure privacy and quiet, and will therefore require provision for positive ventilation.

Dishwashing Room. Because of steam and heat liberated, this area will require the same ventilation rate as the kitchen. Depending upon size of the area, all or the greatest part of exhaust air may be taken off through the dishwasher hood which eliminates dissemination of humid air throughout the area. Exhaust ductwork should be noncorrosive and watertight to handle condensation of steam and should be graded and dripped to a convenient drain.

Dining Space. The ventilation of this space will conform to local codes. Where cafeteria service is provided, serving areas and steam tables are usually hooded. Hood air handling capacities will be somewhat less that those required for the cooking area.

Housekeeping Facilities

In this area are central linen room, sewing room, housekeepers' office, soiled linen rooms, and laundry. Of these facilities, the soiled linen rooms and laundry only will require special attention and these items will be enumerated.

Soiled Linen Storage Room. As a storage space prior to laundering, this room is subject to odors from used linens and will require ventilation at a rate of not less than 8 air changes per hour.

Laundry. Ventilation should conform to local codes but in the absence of such codes, a minimum of 10 air changes per hour is recommended.

The design of laundry ventilation systems seldom receives the study necessary to provide proper safeguards against the recontamination of linen during the cleaning process by airborne organisms.

The activities associated with sorting of linen and loading of washers are reported to add heavily to the contamination of the laundry air. This contaminated air is then drawn through extractors and tumblers where the linen acts as a filter and collects the organisms. It is reported many of these organisms survive the heat of the ironing process.

To reduce the contamination of the laundry air, it is recommended that the sorting of linen be done in an enclosed area separated from the main laundry. This area will require 8 air changes per hour and should be maintained at a negative pressure by the ventilation system. Of the various laundry equipment, the flat work ironer produces the greatest amount of heat and vapor. It is usual practice to install a canopy over the ironer to concentrate and remove the heat immediately at this point. Most laundry layouts will permit the greatest part of the exhaust to be discharged through the canopy although some exhaust should be provided over the washers to remove heat and vapors originating from this equipment. The exhaust from tumblers should be carried away independently of the general exhaust system and may require lint filters in addition to those on the tumbler. All laundry exhaust should be carried to a point above the roof or to an outlet where it will not be obnoxious to other areas of the hospital. This laundry exhaust should not be in close proximity to fresh air ventilation intakes.

Fresh air supply is a requisite to good ventilation of this area and distribution designed to avoid short circuiting is important. The design may lend itself to the use of air-to-air heat exchangers for better economy of operation.

Boiler Room

Ordinarily too little attention is given to proper ventilation of the boiler room. Exhaust ventilating fans which compete with the boilers and the chimney for an insufficient air supply are not uncommon. The air supply to boiler rooms should be computed on the basis of providing both comfortable working conditions and the air quantities required for maximum combustion rates of the particular fuel. Boiler and burner ratings will establish maximum combustion rates, and air quantities can be computed according to the type of fuel. The following table gives approximate quantities of air required per unit of fuel:

Natural gas	10 cu ft per cubic foot of gas
Oil	1500 cu ft per gallon of oil
Bituminous coal	133 cu ft per pound of coal

Maintenance Shops

Carpenter, machine, electrical, and plumbing shops present no particular difficulties but the ventilation of paint shops and paint storage areas is very important and should conform to local codes. There is the danger of fumes.

Employees' Facilities

This area will include locker rooms, toilets, showers, and rest rooms for nurses, male, and female employees. These rooms will be treated to provide comfort and to conform to local codes.

Appendix A—Practical Considerations

Information available from field offices relative to hospital construction under the Hospital and Medical Facilities Survey and Construction Program, indicates considerable annual increase in the number of complete air conditioning systems being installed in new hospitals. While this increase is primarily in the southern section of the country, an increasing number of installations has been noted in the northern states, both among hospitals constructed with and without Federal aid.

Whether to install a complete air conditioning system when planning a new hospital is a major problem to hospital boards except those in areas of the country where extreme climatic conditions prevail. Among factors which should be considered in making a decision are the following: (1) Therapeutic value, (2) public demand, (3) economics, and (4) cost.

Therapeutic Value

One should have a proper appreciation of the therapeutic value of the cooling cycle of air conditioning, aside from the psychological effects which should not be ignored. It requires a review of that branch of physiology of the human body which pertains to metabolism. The process of metabolism produces bodily heat which in cool environments is usually in excess of the quantity required to maintain the normal body temperature of 98.6 deg. When heat is not dissipated from the body at a rate sufficient to maintain a normal temperature, fever results. Fever, in turn, increases the metabolic rate of cell structures further increasing the heat production. Thus a vicious cycle may be established, which can result in great damage to the individual.

Therefore, it becomes apparent that any clinical condition which alters the normal activities of the heat production and heat dissipation mechanism of the body will be benefited by an environment which will compensate for this maladjustment.

Scientific evidence is comparatively meager regarding the effects of humidity, temperature and airborne pathogens on human disease, susceptibility, or the production of disease. However, temperature and humidity control would seem to have definite therapeutic value in the treatment of such clinical conditions as head injuries or operations which affect the heat regulatory center of the brain; cardiac conditions which may be aversely affected by the strain of involuntarily increased blood circulation induced in an attempt to dissipate excess heat; hemorrhagic conditions which reduce the quantity of blood in circulation; thyrotoxicosis which increases basal metabolism; diseases of the liver and kidneys; and the many diseases associated with fever.

In addition, controlled temperatures and humidities and air cleanliness are requisites for the treatment of many allergies.

The idea of ionization of the atmosphere of occupied spaces as a beneficial environmental factor in physical well being has been studied, to some extent, both in this country and abroad. However, it has been demonstrated that ions as such have little or no effect on physical well being.

Economics

The modern hospital, in keeping pace with the advance in medical knowledge and techniques, has become one of the most complex and expensive building types. Annual operating costs (approximately one-third of the total construction costs) are at an all time high. As a result, hospital management, conscious of such costs, is reiuctant to assume the additional financial burden imposed by a complete air conditioning system.

The problem will be resolved for many communities on the basis of climatic conditions and the duration of extremes for the particular locality. Of interest in this regard is the weather map, Fig. 7. This map, while not exact for all areas within the zone boundaries outlined, provides guidance in a general way as to the average number of hours that the outdoor temperature may exceed 80 deg. in different parts of the country.

The possibility of limiting the system to those areas of the hospital where required by clinical treatment or accepted practice should be fully explored. These areas are: Operating, delivery, and emergency rooms, nurseries, x-ray, recovery rooms, special treatment rooms and isolation rooms. However, the therapeutic value of maintaining the physical comfort and mental tranquility of the patient in general nursing areas through air conditioning should not be overlooked. In addition, consideration should also be given to the installation of heating systems which can be adapted to year-round air conditioning if this is desired in the future.

Also to be considered is the efficiency and morale of hospital personnel. Patient care is the prime consideration of any hospital and the quality of care is to a great extent dependent upon satisfied personnel.

While difficult to evaluate financially, air conditioning should offer the following returns:

Reduction in nursing workload resulting from more comfortable patients.

Levelling off of occupancy rates resulting from more summer elective cases.

Reduction in personnel turnover as competition with other enterprises increases.

Maintenance of the over-all efficiency of the entire staff.

Reduction in housekeeping and redecorating costs.

More satisfied patients.

Costs

The investment in air conditioning, which in many instances

Fig. 7. Average number of hours in a year when the dry bulb temperature exceeds 85 F.

will approximate 10% of the total construction cost, is one of the largest single items of cost entering into the structure. To obtain the economy in design and operation, which such an expenditure warrants, requires the closest coordination of work during the initial planning stages between the architect and structural and mechanical engineers. The structural design must accommodate the duct or conduit systems utilizing a minimum of space. It is impractical and unwarranted to expect the mechanical designer to provide the most efficient and suitable system after the architectural plans have been finalized. The selection of materials and techniques of construction will be influenced by a cost and load analysis of the air conditioning system based on the use of insulating materials, types of glazing, shading of glazed areas, orientation, type of system and the many other factors which will affect installation and operating costs.

Sufficient installation and operation data for hospitals upon which to base accurate costs are not available. However, approximations may be based on a ton of refrigeration serving 350 sq. ft. of area and costing between $700 and $900 per ton required. The area of an acute general hospital (apart from one for chronic diseases) which is to be completely conditioned, may be assumed to be 500 sq. ft. per bed. This figure eliminates such areas as: Boiler room, laundry, kitchen, shops and storage. On this basis the system, less the boilers, pumps and accessories necessary for the heating cycle, would cost between $1000 and $1300 per bed or between $2 and $2.60 per sq. ft. Often underemphasized, when considering the cost of air conditioning for new construction, then of the total air conditioning costs, approximately 70% represesents the air handling and distribution system which serves both heating and cooling cycles—refrigeration equipment accounting for the remainder. In colder climates, allowances may be necessary to provide for supplementary heating requirements with certain type systems.

Operating costs, predicated upon many variables, can only be estimated after an analysis of design load, climatic conditions, utility rates and management policies.

Appendix B—Factors Affecting Design

For many years there has been a natural reluctance on the part of the medical profession, hospital authorities and hospital designers to advocate the installation of warm air space heating systems. This reluctance has been justifiably based upon the hazards of cross infection and odor nuisance which might result from the general recirculation of air within the hospital. Studies over the years by eminent investigators are quite inconclusive but there is sufficient evidence to indicate that air-borne infection may constitute a potential hazard. The matter of odor nuisance is well established.

The new impetus which air conditioning has given to the use of air within the hospital should not result in any relaxation on the part of the air conditioning system designer of all practical safeguards against the hazard of airborne infection or of odor nuisance.

Such precautions in design will result in a system which will supplement present hospital aseptic technics such as sterilization, masking, gowning, handwashing, isolation, and many other practiced to reduce the hazard of infection.

The field of hospital air conditioning and design presents many problems not encountered in the usual comfort conditioning system. The basic differences result from the restrictions on air movement, ventilation, and filtering to control odors and to maintain aseptic conditions, temperatures, and humidities required for certain areas and exactitude in design which will provide positive balancing of the system.

The following fundamental information accentuates some of the conditions the designer must bear in mind when planning the system:

1. The hospital patient, due to his incapacitation or for other reasons, may be susceptible to infections from mild concentrations of pathogens which would have no effect upon a normal healthy individual.
2. In general, outdoor air used for ventilation, if taken from above the roof, is comparatively free of pathogenic organisms. Air becomes more contaminated after entering the hospital.
3. Recent literature contains many reports of the emergence of antibiotic-resistant staphylococci and streptococci. These resistant organisms are unduly prevalent in hospitals and are important as infectious agents.
4. Pathogenic bacteria and pathogenic viruses are the organisms which make indiscriminate circulation of air a potential hazard.
5. Bacteria and viruses may be disseminated into the air by sneezing, coughing, and the pronunciation of such consonants as p or t. These organisms are expelled with moisture from the linings of the nose and throat and are classed according to size as droplets or droplet nuclei. The droplets being larger settle very quickly to the floor or other surfaces where after drying they may become air-borne as dried mucous or as attachments to dust, lint, or other materials. Droplet nuclei being comparatively small very quickly loose moisture and because of their very slow settling rates may be considered as suspended in the air until breathed or vented. Bacteria and viruses which have settled out of the air may be reintroduced into the air by traffic over floors and by many of the housekeeping activities such as: Bedmaking, linen changing, dusting, sweeping, or mopping.
6. Of interest is a report of over 100 million streptococci found in one ounce of dust collected in a 26-bed hospital ward during an outbreak of streptococcal sore throat and follicular tonsillitis. This amount of dust reflected acceptable housekeeping.
7. Bacteria and virus, depending upon conditions, retain their viability for a considerable length of time. A few examples as reported are:

   Streptococci, 6 weeks to 12 weeks.
   Virulent diphtheria organisms, in dust 3 months.
   Pneumococcus, several weeks in dried state in dust.
   Melbourne strain influenza may retain its potency for embryonated eggs, 45 days.

Among the many measures which may be used to reduce the hazard of air-borne infection are air movement, humidity, ventilation, sterilizing lamps, bactericidal aerosols, and filtering.

Air Movement

The trend in modern hospital design toward the provision of more private and semi-private rooms has had the effect of reducing the possibility of contact contamination between patients.

Because of this separation of patients, the hazards of direct inhalation of infectious droplets should be reduced and dust, lint, and dried mucous may assume more importance as carriers of droplet nuclei. Therefore, the control of air movement is important not only to protect patients or personnel from unnecessary drafts, but to avoid the reintroduction into the air of concentrations of pathogens which have settled out of the air onto floors, bedclothing, and furniture. Location of air inlets and exhaust of the conditioning system and direction of air throw should be carefully studied, and velocities at floor level should be kept below 50 fpm.

Humidity

Reports of studies of the lethal effect of humidity upon pathogenic organisms are at some variance. It is, however, considered by many that a relative humidity of 50% has the maximum lethal effect upon these organisms.

Ventilation

The reduction of the concentration of pathogens in the air below certain critical levels is very desirable to reduce the incidence of infection. Such dilution is required for certain isolation, treatment, and aseptic areas. The removal of contamination by ventilation is based on a simple logarithmic law common to physical and biological processes where the rate of disappearance of a substance at any moment is proportional to the concentration present at the moment. Therefore, each successive air change reduces contaminants in the ratio of 1/e, that is 1/2.718. Assuming no additional contaminants enter the area during the air change, then 63.2% of the original air and contaminants would be removed by one air

change and each successive air change would reduce the remaining contamination in a like amount. However, in practice, contamination must be considered as continuous during periods of use of occupied areas and therefore reduction of contamination to the vanishing point cannot be obtained. This does illustrate the value of ventilation as a practical application for reducing concentrations of contaminants. The literature contains reports attesting to the value of ventilation as a means of reducing contamination.

Sterilizing Lamps

Ultraviolet radiation has been used as a bactericide but systems designed for complete sterilization require careful engineering plus a degree of maintenance difficult to achieve in the hospital.

The greatest bactericidal effectiveness is from rays at 2537 Angstrom Units (AU) with highest efficiencies at approximately 80 deg. The efficiency diminishes as the temperature increases or decreases from the optimum region. The literature reveals a difference of opinion among investigators as to the effect of humidity upon the lethal effectiveness of the rays. Bactericidal effectiveness is dependent upon the ray intensity and the exposure time. The dosage is expressed in microwatt minutes per square centimeter.

As direct exposure of skin and eyes to the rays will cause erythema and conjunctivitis, it is necessary that the lights be located and shielded so that patients and personnel are not in the direct or reflected rays. In the areas to be treated by the lamps, installations are generally made to irradiate the air above the 7 ft. level and in some instances below the 30 in. level.

In areas where upper air installations of sterilizing lights are contemplated, the materials or finishes of the walls and ceilings must have a loy reflectance. Oil paint finishes among others, are considered safe as opposed to finishes such as white coat plaster which has a high reflectance. Ceiling heights are of no significance where high reflectance (15-40%) finishes are used.

Installations of sterilizing lamps are not recommended for general use in the hospital at this time because of the maintenance required in metering and cleaning the lamps to insure lamp efficiencies, the limitation of lamp location and shielding required for protection of patients and personnel, and the possibility that lethal exposure may not be secured especially for organisms transported on dust.

Sterilizing lamp installations in duct systems operating under carefully controlled conditions have been reported as highly efficient. However, since these conditions are difficult to duplicate in the hospital, such installations are not considered practical at this time.

Sterilizing lamps have been principally used in operating rooms, nurseries, and contagious disease wards. With proper care, the life expectancy of various types of ultraviolet lamps is considered to be as follows:

Hot cathode type	7500 hours
Cold cathode type	17,500 hours
High intensity (slimline) type	6,000 hours

Bactericidal Aerosols

The application of aerosols in hospitals as air disinfectants up to the present time has been very limited.

Triethylene glycol, among other bactericidal aerosols, being odorless, tasteless, and very hygroscopic, meets the requirements for such a disinfectant. In addition it is nontoxic and not harmful to fabrics and furniture in bactericidal concentrations required for air disinfection.

Condensation of the vapor in proper concentrations on microorganisms is necessary to produce bactericidal action. Because of the low vapor pressure of triethylene glycol, the concentration which saturates the air is dependent upon relative humidity. The effectiveness of the glycol is greatly reduced at humidities above 60%. Since triethylene glycol vapor must be maintained at about 90% saturation level, and the glycol air saturation level varies with the relative humidity and temperature, it is necessary to use air conditioning to maintain effective glycol air concentrations. Harmless fogging will become apparent if the concentration of glycol is near or above the effective saturation level.

Triethylene glycol decomposes at temperatures above 290 deg C. and also if subjected for long periods to temperatures above 120 deg C. As the products of decomposition may be irritating or toxic, and because of the necessity for maintaining proper concentrations, the vaporizing equipment and controls must be carefully selected.

Dust or lint protects microorganisms from condensation of the glycols in proper concentrations, and therefore very exact dust suppression measures are necessary for areas where they are to be used.

Because of the exact controls necessary for maximum effectiveness, the general use of glycols is not recommended at this time although they may be applicable for communicable disease wards.

Filtering

Proper filtering of air used for the ventilation and air conditioning systems of hospitals is of the utmost importance. Filtration is not only an important aseptic technic but will also reduce housekeeping, painting, and redecorating costs due to dust and soot deposits on wall and ceiling finishes.

Filters are generally classed as mechanical and electronic; both types have many applications in hospital work. Air washers, when installed in larger systems, primarily for humidity control, also serve as air cleaners.

Mechanical Filters

Mechanical filters are those which remove contaminants from the air by means of a porous media. They are classified as permanent cleanable type or as disposable type which are thrown away after having collected a full load of dust. They may have a dry or a viscous coated media.

Filters are also classed as high or low pressure according to the resistance the media offers to air flow at a specific velocity through the filter. Filters used in air conditioning systems are usually designed for face velocities of approximately 350 fpm at resistance between 0.1 and 0.2 in. of water. Such filters remove an insignificant number of those droplet nuclei which contain bacteria. Care should be exercised when selecting filter media to insure compliance with existing codes regulating the use of combustible media.

For efficient filter cleaning controls, manometers are installed at the filter bank to indicate pressure drop across the bank and to eliminate reliance on visual inspection for cleaning periods.

The mechanical type of filter is quite suitable for fresh air intakes to ventilating or air conditioning equipment except where unusual contamination of outdoor air exists. Such conditions will require special study.

For odor control, a very important function in some hospital areas such as X-ray, special treatment and isolation, the mechanical type filter utilizing an activated carbon media is very effective. Installations of this type of filter require a mechanical filter with conventional media ahead of the charcoal filter.

Studies of the effect of ozone as an air deodorant are quite inconclusive and its use for this purpose is considered hazardous by some authorities. Small concentrations in air have been found lethal to test animals.

Glass fiber filters and paper filters utilizing glass fibers with diameter of approximately 1 micron have been reported as having efficiencies of 99% in the removal of bacteria and virus at air velocities of 20 fpm at resistances between 0.5 and 3.2 in. of water. Such filters, because of their comparatively high resistance to air flow and because of the maintenance required, are not generally used in ventilating systems of hospitals. Where used, the life of the filter is prolonged if it is preceded by a dust-stop type of mechanical filter. They may be applicable for outboard exhaust from bacteriological laboratories and from isolation units. Glass fiber filters have also been reported as being effective in the removal of radioactive aerosols.

Electronic Filters

Electronic filters are produced in two principal types, an ionizing type and a charged media type.

Ionizing Filters: In the ionizing type collector the dirt particles are given a positive charge as they are carried through an ionizing field of approximately 12,000 volts and they are precipitated on negatively charged collector plates by electrical attraction as they pass on through the filter. The service for operation is obtained from 110-120 volt, 60-cycle, single phase building service. The collector plates are coated with an adhesive emulsion and are cleaned with hot or cold water by manual or automatic washing.

The dirt accumulation is washed to the drain in the waterproof floor of the filter housing. The resistance of the ionizing type filter including after-filter, usually ranges from 0.15 to 0.25 in. of water at an air velocity of approximately 400 fpm.

However, chunks of dirt will blow off of the collector plates if heavy accumulations are permitted to collect due to negligence in cleaning. Power consumption is estimated at approximately 60 watts per 1000 cfm of air cleaned. This type of filter with viscous coating is reputed to have efficiencies of 90% by the National Bureau of Standards discoloration test method. Such efficiencies are dependent upon standard of maintenance which is costly and difficult to achieve in the hospital. Its efficiencies do, however, indicate its use in hospitals for fresh air inlets or where general recirculation of air is proposed through a central system. Because of the possibility of sparking, this type of filter is not considered acceptable for handling air containing explosive gases.

Charged Media Filters: This is a dry type disposable filter using a dielectric mat filtering media. This filter uses no ionizing field, the charged media acting as a collecting electrode. Dust particles as they pass to the filter are polarized and drawn to the charged fibers of the media. The media is charged with 12,000 volts d-c from a power pack similar to, but smaller for comparable air quantities, than that used with the ionizing type filters. This type of filter is not as efficient as the ionizing type for dust removal, and like the disposable conventional filter, its resistance increases as dust accumulates on it. As the dielectric properties of the filter are adversely affected by humidities above 70%, it is not recommended for inlet installations handling high humidity air.

Acknowledgment

This study prepared under the direction of John W. Cronin, M.D., former Chief, Division of Hospital and Medical Facilities, Public Health Service, was made possible through the interest and assistance of many who contributed unsparingly of their time and efforts. Appreciation is expressed to all those in the fields of medicine, hospital administration, engineering and architecture, and to the staff members of the Division of Hospital and Medical Facilities, Public Health Service, whose assistance has been very helpful.

Engineering Aspects of Disposing Radioactive Wastes

Characteristics of gaseous and/or air-borne particulate wastes vary widely depending on the nature of the operation from which they originate. In gaseous form they may range from rare gases, difficult to remove, such as argon from air-cooled reactors, to highly corrosive gases such as hydrogen fluoride from chemical and metallurgical processes. Particulate materials (aerosols) may be organic or inorganic and range in size from less than 0.05 microns to 20 microns. The smaller particles originate from metallurgical fumes caused by oxidation or vaporization. The larger particles may be acid mist droplets which are low in specific gravity and may remain suspended in air or gas streams for longer periods.

An outstanding feature of air cleaning requirements for many nuclear energy operations results from the extremely small permissible concentrations of various nuclides in the atmosphere. Often removal efficiencies of the order of 99.9% or greater for particles less than 1 micron in diameter are necessary. These criteria are much more stringent than heretofore encountered in industrial hygiene engineering, and in the early days of the industry, could not be met by general industrial dust control equipment that was then available.

This situation was met by a research and development program that encompassed fundamental studies on the characteristics and behavior of aerosols, the design of specialized equipment and the evaluation of the dispersion of these materials into the atmosphere. As a result of this program, such air cleaning units as high-efficiency filters capable routinely of removing 99.95% of particles 0.3 microns in diameter were developed and put into commercial production. A packed tower unit which utilized the chemical reaction between iodine and silver nitrate and capable of removing iodine from gas streams with efficiencies greater than 99.99% was designed and put into successful operation, and other special air cleaning devices were developed.

The principles of atmospheric diffusion and dispersion were quantitatively evaluated to the point where these factors could be utilized in the over-all design of gaseous waste treatment facilities. Also, fundamental information was, and is being, obtained on the characteristics of aerosols to serve as a sound basis for improved assessment of gaseous waste problems and continued development of improved air cleaning equipment.

Some aspects of future air cleaning problems which require further technical effort include high efficiency filtration at temperatures above 1000 to 1500 deg F, and, if very short time cooled fuels are processed, even more efficient removal of iodine. The question of the biological role of a discrete, individual radioactive particle is still under active consideration and its resolution might well influence the performance criteria of engineering facilities designed to control particulate effluents. Nevertheless, for the most part, handling and disposal of gaseous wastes from nuclear facilities is amenable to practical engineering control.

Solid radioactive wastes such as non-usable contaminated equipment, non-recoverable scrap, and contaminated trash which are produced in all operations do not constitute a serious technical problem. However, if inadequate provisions are made for their proper handling and disposal they could be a distinct nuisance and, under certain circumstances, even a hazard.

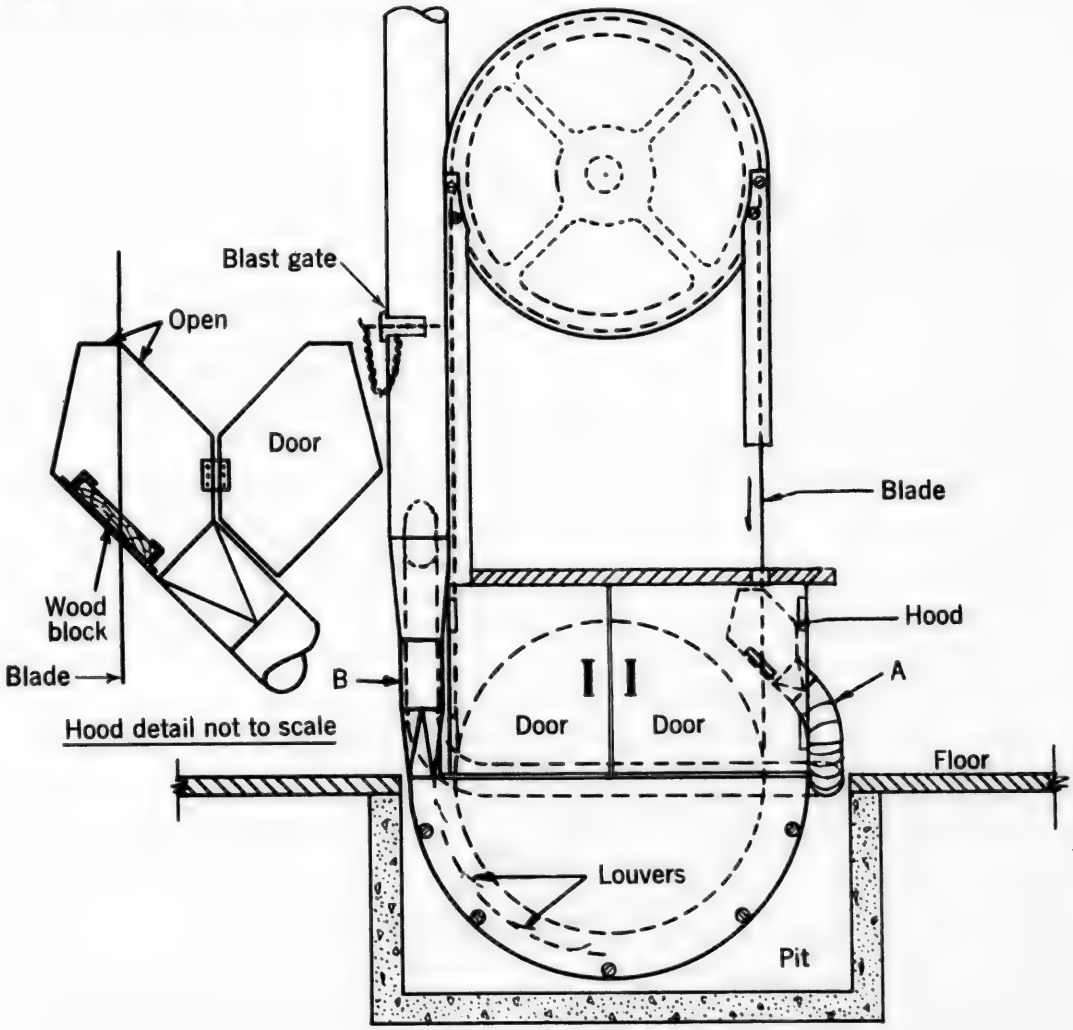
Incineration of combustible, solid wastes to reduce volume and facilitate ultimate disposal has been practiced to a limited extent. The engineering and economic advantages of incineration over other approaches, including compressing, baling and direct burial have not been demonstrated but concentration by burning may be practical in specific circumstances. A special unit to burn 30 pounds per hour has been developed by the U. S. Bureau of Mines and is now being put into operation at the Harvard Air Cleaning Laboratory in connection with final development of a suitable air cleaning component. Where quantities of activity associated with solid wastes are low, the use of a "solid dilution" approach, i.e., disposal into a municipal or institutional incinerator may be acceptable. This problem is now being considered in some detail by a special sub-committee of the National Committee on Radiation Protection of the U. S. Bureau of Standards. An NBS Handbook on this subject is the objective of this sub-committee.

This material is from a talk by Joseph A. Lieberman, sanitary engineer, Engineering Development Branch, U. S. Atomic Energy Commission.

BAND RESAW

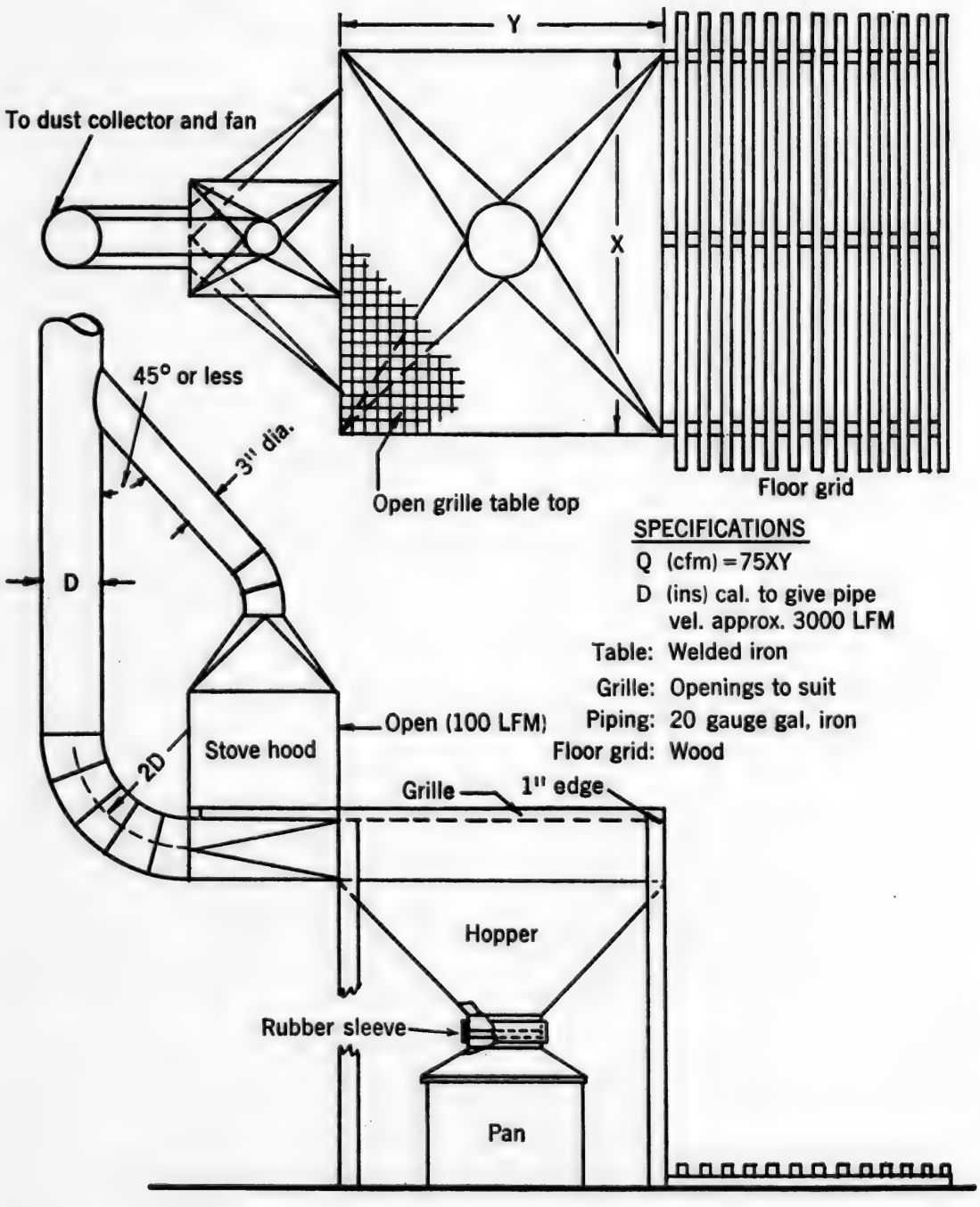
MINIMUM PIPE SIZES AS REQUIRED BY CODE		
SAW WIDTH, IN.	DOWN RUN PIPE A, IN.	UP RUN PIPE B, IN.
2 - 3	5	4
over 3 - 4	6	5
over 4 - 6	7	5
over 6 - 8	8	5

Note: If condition necessitates, enclose upper idler and attach suction pipes



Drawing Through Cooperation of New York State Department of Labor
Division of Industrial Hygiene—Engineering Unit

VENTILATED SOLDERING BENCH



SPECIFICATIONS

Q (cfm) = 75XY

D (ins) cal. to give pipe vel. approx. 3000 LFM

Table: Welded iron

Grille: Openings to suit

Piping: 20 gauge gal. iron

Floor grid: Wood

Drawing Through Cooperation of New York State Department of Labor
Division of Industrial Hygiene—Engineering Unit

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

TUBING HANGERS. Now available from the manufacturer is one complete line comprising every standard type of hanger and support for copper tubing. Catalog is available.
Inside front cover — Item 126

INDUCED DRAFT DUCT FAN. Regardless of the problems posed by weather or surrounding conditions, the manufacturer's induced draft duct fan provides instant draft and maintains constant draft at the required rate of flow of flue gas through the boiler system. 20-page bulletin is available.
Page 1 — Item 127

ALUMINUM INSULATION. Advertisement features ventilating tips for efficient control of moisture condensation. Informative booklet on moisture condensation in building walls is available.
Page 7 — Item 123

WROUGHT IRON PIPE. To check corrosive attack in pipe carrying brine for ice skating rinks at the Kentucky Fair and Exposition Center's Coliseum at Louisville, designers specified 52,000 feet of 1-inch wrought iron piping. This pipe was also installed in the Center's condensate return and pump discharge lines. Special report on ice skating rinks is available.
Page 9 — Item 129

DIAPHRAGM TYPE FLUSH VALVES. In two new high school additions to the Cedar Rapids educational system, the manufacturer's diaphragm type flush valves were selected to provide the enduring service that school operation demands. Handbook is available.
Page 11 — Item 130

HEATING AND COOLING COILS. The manufacturer's smooth-fin coils offer greater transfer per square foot of space area and also lower airway resistance, requiring less power per cfm. Bulletin is available.
Page 13 — Item 131

TEMPERATURE REGULATOR. Manufacturer's temperature regulator features instant response and absolute accuracy. Regulator has hydraulically formed, nonferrous bellows type thermostat. Information is available.
Page 16 — Item 132

MOTORS AND PUMPS. Manufacturer features unit responsibility, national network of distributors and warehouse stocks for fast, dependable delivery of motors and pumps for air conditioning installations. Information, name of nearest distributor are available.
Page 18 — Item 133

IMPULSE STEAM TRAPS. Manufacturer's steam traps of the impulse type are available to meet practically every trapping requirement including light condensate loads, heavy condensate loads and normal steam trap requirements. Descriptive bulletin is available.
Page 19 — Item 134

AIR FILTERS. One man spent less than eight hours a week maintaining this company's air filters on nine air conditioning systems using 200,000 cfm because the units clean themselves continually while cleaning the air. A 12-page booklet with data on the air filter performance is available.
Pages 20-21 — Item 135

SEAMLESS PIPE. The manufacturer's seamless pipe in sizes from 4 to 16 inches O. D. was utilized in the heating and air conditioning system of new Texas National Bank Building. Information is available.
Page 22 — Item 136

AIR FILTERS. Air filters are made by this company of soft glass fiber which provides a dust collecting area without interfering with air flow. They are moisture proof and fire resistant. The glass fiber filter does not splinter or shred. Information is available.
Page 23 — Item 137

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Circle numbers corresponding to the items and advertisements in which you are interested. Print your name and address clearly. Information will be sent directly from manufacturers.

Ad-Digest

SELF-CONTAINED AIR CONDITIONERS. Manufacturer features quiet of self-contained air conditioners. Modern compressor plus exclusive package design assures smooth vibration-free operation. Catalog is available.
Pages 24-25 Item 138

STEEL PIPE. Thirty-two hundred miles of the manufacturer's steel pipe was installed in new homes at Lakewood, Calif. It is an excellent plumbing and heating pipe, not only for the home building field, but for industrial installations as well. Information is available.
Page 28 Item 139

MOTOR DRIVEN PUMP. Advance features and rugged construction, low cost operation and ease of installation make the manufacturer's motor driven pumps the choice of architects, engineers and contractors for air conditioning systems. Information is available.
Page 29 Item 140

AIR MIXING UNIT. The City-County Building in Detroit, Mich., installed 3600 of the manufacturer's dual duct air mixing units. Units are usable in large or small existing or new buildings. Application data are available.
Page 30 Item 141

HEATING AND COOLING EQUIPMENT. The manufacturer offers a wide variety of heating and cooling equipment including combination heating, cooling units, water chillers, unit heaters and radiant and warm air baseboards. Information is available.
Page 31 Item 142

AIR CONDITIONING EQUIPMENT. Manufacturer's cooling, heating, air handling and air conditioning products are designed, engineered and manufactured to work together. The complete line is backed by expert service before, during, and after the sale. Information is available.
Pages 32-33 Item 143

STEEL PIPE. Advertisement describes manufacturer's distribution system and states that highest quality steel pipe is provided at the right price by coordinating distribution with mill production Information is available.
Page 34 Item 144

FRACTIONAL HORSEPOWER MOTOR. The manufacturer's fractional horsepower motor is from 3 to 8 lbs lighter per motor than previous models of the same horsepower rating; yet it is rugged enough to permit direct mounting, and compact enough to fit in tight spots. Information is available.
Page 35 Item 145

ALUMINUM FINS. Important in the manufacture of heat transfer surfaces is the aluminum fin's ability to withstand rapid, mechanical forming in production and assembly, without developing cracks or buckling. Also desirable is the ability to withstand temperature, moisture and mechanical attacks. Details are available.
Page 36 Item 146

PERIMETER RADIATION. Manufacturer's perimeter radiation equipment was chosen for intsallation in the St. Paul's Reformed Episcopal Church in Oriand, Pa. Information is available.
Page 37 Item 147

AUTOMATIC ELECTRIC HUMIDIFIERS. Automatic electric industrial humidifiers are designed to provide capacity for practically any size requirements. The humidifier, introducing humidity as a water vapor, removes up to 70% of all bacteria in the air stream circulating through the unit. Information is available.
Page 38 Item 148

AIR FILTERS. Economical and light weight aluminum filters are available for residential, commercial or industrial applications. Ideal for new or existing installations, they reduce operating costs through longer service life and top performance. Information is available.
Page 39 Item 149

AIR FILTERS. Typical of this company's products are 1, 2, and 4-in. thick panel filters, self-washing filters, and grease eliminators. Demonstrations are offered in plants under the particular plant's operating conditions. Information is available.
Page 40 Item 150

MODERN COAL BURNING. Many industries such as Thomas A. Edison, Inc. of West Orange, N. J. are burning coal the modern way and finding fuel and maintenance costs down, efficiency and availability up. Qualified engineering firms can provide the latest information on fuel costs and equipment. Additional case histories of modern coal burning installations are available.
Page 41 Item 151

MOTOR STARTERS. Manufacturers of large refrigeration and air conditioning installations frequently are confronted with power company motor starting current limitations. To reduce line voltage drop and eliminate light flicker the part winding motor with its special starter may be a low cost answer for such a requirement. The manufacturer's motor starters are available for 2 and 3-step starting of such motors. Catalog is available.
Page 42 Item 152

AIR HANDLING EQUIPMENT. Seventy-five of this company's fans and twenty-two of its air conditioning units were selected for the fully air conditioned Socony Mobil office building in New York. The company manufactures air handling equipment for plants, hotels, institutions, stores, and public buildings. Information is available.
Page 43 Item 153

AUTOMATIC TEMPERATURE CONTROL. Both comfort and the cost of comfort in today's school are determined largely by the efficiency of the control system. The manufacturer's system of automatic temperature control was installed in the new Edison Junior High School of Sioux Falls, S. Dakota. Information is available.
Pages 44-45 Item 154

STEAM TRAP. Steam lines are kept hot, dry and efficient with installation of manufacturer's inverted open-float steam traps. Devices are designed to drain condensate accumulation automatically and instantly. Literature is available.
Pge 46 Item 155

FOUNDRY ENVIRONMENT CONTROL. An engineering manual for control of in-plant environment in foundries is available. The manual promotes standards for dust elimination and control equipment as well as the improvement of shop operating conditions.
Page 47 Item 156

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FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

Ad-Digest

STEAM HUMIDIFIERS. This company will help you humidify an office, a cement plant, or a church at less cost by steam humidification. Steam is discharged directly into room, duct, or plenum chamber. For explosive atmospheres, there are air-operated models. Relative humidity held within 2 to 4% of setting. Practically no maintenance. Bulletin available.
Page 48 Item 157

INDUSTRIAL DIFFUSER. Manufacturer's industrial diffuser reduces waste cooling of overhead space. Adjustable diffusers permit full range of air patterns to meet all area requirements. Details are available.
Page 49 Item 158

PRECISION TEMPERATURE CONTROL. An advanced new concept for assuring ideal indoor weather with the utmost accuracy and simplicity is developed by manufacturer. The system combines electronic sensing with positive positioning electric motor operators. Bulletin is available.
Page 50 Item 159

AIR CONDITIONING UNITS. Manufacturer's air conditioning units cool and dehumidify in summer, heat and humidify in the wintertime. Coming in vertical and horizontal types they use a direct expansion refrigerant, cold water or brine for cooling, steam or hot water for heating. Information is available.
Page 51 Item 160

ROOM AIR CONDITIONERS. Manufacturer's room air conditioners are featured in the new Eastmore House, New York City, N. Y. Each room is cooled and regulated separately; in addition each occupant may, if desired, pay for the air conditioning used. Information is available.
Page 52 Item 161

REGISTERS AND GRILLES. A line of registers and grilles are made by this company for the control of warm air heating and for year-round heating and cooling. The line includes single damper forced air registers, ceiling air diffusers, perimeter baseboard diffusers and registers, and perimeter floor registers. A catalog of the complete line is available.
Page 53 Item 162

HEATING EQUIPMENT. Manufacturer provides complete hot water line for more profit on hot water heating jobs. Line includes convectors, baseboard, unit heaters, pumps and specialities. Catalog is available.
Page 55 Item 163

INTEGRAL FURNACE BOILERS. A leading machine tool manufacturer, Greenlee Bros. & Co. of Rockford, Ill., cut fuel costs 17 per cent with the installation of the manufacturer's integral-furnace boilers with jet ignition stokers. Information is available.
Page 119 Item 164

CENTRIFUGAL ROOF VENTILATOR. Manufacturer's centrifugal roof ventilator is developed and manufactured with applied centrifugal blower principles. Machines feature quietness, adaptability, efficiency and sturdiness. Bulletin is available.
Page 121 Item 165

UNIT HEATERS. Manufacturer's line of unit heaters includes horizontal delivery model in blow-through and draw-through types in 36 different capacities for steam and hot water service. Vertical delivery models are offered in 26 capacities. Bulletins are available.
Page 123 Item 166

DOOR HEATERS. When large outside doors are opened in winter time a curtain of hot air covers the opening. Door heaters use little heat as they operate only when doors are opened. Bulletin is available.
Page 125 Item 167

DRAFTLESS AIR DIFFUSERS. The all-air high velocity units with new simple automatic controls deliver constant volume regardless of fluctuation of inlet pressures of either the hot or cold valve. Capacities of constant volume units can be pre-set at the factory.
Page 127 Item 168

AIR DIFFUSERS. Square and rectangular air diffusers are equipped by this manufacturer with built-in diffusing vanes arranged in unlimited louver patterns. A catalog showing how to select the proper size and pattern for particular job conditions is offered by the company.
Page 129 Item 169

COOLING TOWERS. Manufacturer's cooling towers contain all components necessary for satisfactory performance, economy, and simple maintenance. There are no short cuts that prove expensive in the long run. Information is available.
Page 131 Item 170

VENTILATOR CURB. Noise reduction problems are present in every industry. The manufacturer contributes towards the minimizing of sound and noises by its new ventilator curb. Bulletin is available.
Page 133 Item 171

AIR CONDITIONING EQUIPMENT. Eighteen pamphlets containing helpful air conditioning and refrigeration data are available from this manufacturer of heating, ventilating and air conditioning units. Items include the cooling tower, a discussion of steam, water and direct expansion, air handling, the air cooled condenser, central plant air conditioner, and ceiling-hung conditioners.
Page 133 Item 172

DUCT INSULATION BOARD. Manufacturer's insulation board is a semi-rigid insulation of fine spun mineral fibers bonded together with a thermo-setting resin. It is ideal for use on all types of heating, ventilating, air conditioning or combination ducts. Information is available.
Pages 136-137 Item 173

GAS BURNERS. This line is recommended when you have a job that calls for a forced-draft gas burner. Illustrated is one with a capacity of 100,000 to 5,400,000 Btu per hr. It comes in 7 sizes. Features include non-pulsating flame and explosion-free circuit. Bulletin available.
Page 138 Item 174

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Ad-Digest

PIPE FITTINGS. Manufacturer's pipe fittings feature smooth walls inside and out, sharp, clean threads, accurate machining and freedom from porosity and defects. Condensed catalog is available.
Page 139 Item 175

GAS UNIT HEATERS. Fast, uniform heat, self-cleaning ports and improved combustion are three reasons why manufacturer's gas unit heater provides low cost efficiency for any commercial industrial or institutional application. Bulletin is available.
Page 140 Item 176

FLEXIBLE DUCT CONNECTORS. Flexible duct connectors are made by this company in one-piece, factory-assembled, metal-to-material units that unroll flat. A choice of canvas, asbestos, or neoprene-coated fiber glass is offered attached to galvanized steel or aluminum in 25, 50, or 100-ft rolls. Catalog and specification sheet are available.
Page 141 Item 177

HUMIDITY CONTROL. The manufacturer's method of humidity control provides more effective air conditioning because cooling and heating functions are made separate from adding or taking away of moisture. Two bulletins which describe system are available.
Page 141 Item 178

STEAM HEATING COILS. Steam distributing tube heating coils of this manufacturer have all tube outlets from the header extruded to provide double thickness for tube insertions. The tubes are fabricated from 0.035-in. copper; nipple connections are brass. Catalog is available.
Page 143 Item 179

INDUSTRIAL HEATERS. Portrayed in story form are industrial unit heaters available from the manufacturer's especially the one and one-half million Btu per hour model called the Giant. Publication is available.
Page 144 Item 180

PIPE UNION. Manufacturer's pipe union features extra wide bronze seats, practically unbreakable nut and body, heavy shoulders and individual vacuum testing. Information is available.
Page 146 Item 181

REFRIGERATING EQUIPMENT. Nine of this company's compressors carry the air conditioning load, divided into three systems, for the first completely air-conditioned large hotel in the North, the Claypool at Indianapolis. Ice-making and quick freezing equipment also offered. Information available.
Page 147 Item 182

AUTOMATIC SHUTTER. Manufacturer's automatic shutter is unusually sensitive to air current causing the aluminum louvers to open instantly when fan is turned on and snap shut when fan is turned off. Information is available.
Page 147 Item 183

HEATERS. Direct-fired warm air heaters are made by this company in a full range of sizes for gas, oil, or gas-oil firing. A gas-fired, infra radiant heater is also made by the company for commercial and industrial heating. Bulletins are available.
Page 147 Item 184

VENTILATION MANUAL. The fourth official edition of an industrial ventilation manual has been enlarged, improved, and includes many new tables. It contains the information needed for the design of industrial ventilation systems.
Page 148 Item 185

INTERIOR FIRE PROTECTION. Manufacturer's interior fire protection line more than meets specifications. It also meets the highest standards of safety plus design, practicality and economy. Bulletin is available.
Page 149 Item 186

INDUSTRIAL VENTILATORS. For industrial venting and heating plant exhausting the manufacturer has line of 56 standard and heavy duty model blowers. Capacity ranges from 140 to 16,700 cfm with or without stacks. Engineering databook is available.
Page 150 Item 187

HIGH VELOCITY AIR FILTERS. These filter media have special hemmed edges for strength and safe, easy handling. They have a maximum efficiency from 288 to 510 fpm. Low velocity and grease filters are also made. Catalogs available.
Page 151 Item 188

ELECTRIC HEATING. New application information on the uses of electric heating equipment for winter weather problems is given in a book offered by this manufacturer. Factual reports give solutions to problems on room heating, snow melting, de-icing, or warming materials.
Page 151 Item 189

AIR DIFFUSERS. The complete line of air diffusers offered by this company meets all requirements for cooling, cooling and heating, and supply and return. They are adjustable, and are available in a wide variety of shapes. Catalog may be obtained.
Page 152 Item 190

DIRECT FIRED HEATERS. Low installation cost and ready heat are provided by the manufacturer's stainless steel direct-fired heaters. Completely automatic and engineered for perfection, the heaters have gas, oil or dual gas and oil capacities from 300,000 to two million Btu per hour. Data are available.
Page 154 Item 191

DESIGNERS WANTED. The manufacturer has immediate openings for heating and ventilating designers. Interesting and challenging professional work assignments are among major job advantages. Information is available.
Page 155 Item 192

VALVE LINE. A line of flow controlled valves includes packless and packed valves, strainers, dryers, check valves, relief valves, 3-way valves, liquid gage sets, flange unions, and accessories for air conditioning, refrigeration, and industrial users. A catalog describing the valves and two catalogs on ammonia valves and steel fittings are available.
Inside back cover Item 193

WATER LEVEL CONTROL. Advertisement illustrates point of the choice between cheap and more expensive life saving equipment; obvious in the case of a parachute, it should be just as obvious regarding safety controls. Condensed catalog is available.
Back cover Item 194

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BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE

When Engineers Go Public Speaking

ROBERT H. EMERICK
Consulting Mechanical Engineer, Charleston, S. C.

THE screaming bird matched my every word with a scream; when I held my tongue he, with perfect timing, held his. I talked louder to drown him out; he screamed louder and drowned me out.

The place was the Inter-American Womens Club of Colon, Republic of Panama, and I was having enough trouble anyway, trying to make important points with an audience that in many instances, was far more fluent in Spanish than in English. The winged heckler kept himself concealed in a tree outside the window, and as it became obvious I was losing the contest, the ladies of my audience began to titter, then the titter became frank laughter and I said to myself, "Now I'm really getting the bird."

How I saved the occasion will be discussed among the techniques for defeating hecklers, both living and inanimate; meanwhile, let's examine the first thing we should do after agreeing to make a speech. The rule is simple: organize our material. Incidentally, when I'm offered a subject, I reject the offer unless I'm already familiar with it; guessing in public is very bad for an engineer's reputation.

Our best organizing method is to divide our material into four basic categories:

1—"Ho-hum." Into this classification goes the material used for starting the talk, and we will select it with the object of waking them up.

2—"Why bring this up?"—Here we present the reasons the audience is affected by the subject of the talk.

3—"For instance."—The body of the speech is formed by the "for instances." Each one must illuminate the theme or emphasize a point, and proves that the audience is really affected by the subject. A joke or light story among the for instances can be good planning, provided the humor fits the situation.

4—"So what?"—Here is offered the closing material, and it should be so selected and presented that the listeners leave with something to think about, a thought to take home.

To illustrate how these arrangements are applied, consider my case of the screaming bird. The subject was Panama's engineering future, and since this was primarily an audience of women, I began my talk with a discussion of babies, Panama babies. All women are interested in babies, even those who say they don't like babies, and I promptly satisfied the "why bring this up?" by pointing out that from Panama's birthrate of 125 per thousand, must come Panama's engineers of the future.

My "for instances" naturally became the problems of the Pan-American highway, not yet a decent road in most of Panama; the need for flood control in order to keep what there is of the highway in service; electric power development and how the extension of lines to the interior would benefit the entire nation; the shortage of bridges and roads; the need for refrigeration, air conditioning, and even heating, because the mountains of Panama are cold. Somewhere between the mountains and the bridges, my heckler the bird, began his competition, and as many of my points were dulled effectively by his squawking, I rehashed a bit in the "so what?" of my close, which can be a successful trick for emphasis.

In this case, the "so what" was an admonition to the women of Panama to widen and improve the technical education in their country, to recognize that children were their country's greatest potential, and never to shoot the stork. This last is more serious than it seems, because feeding the mouths of Panama is not easy in its present skimpy economy. Malnutrition is widespread.

With our material organized into the four categories suitable for our purpose, we next plan the presentation. We can, (1) read the speech; (2) memorize it; (3) give it from notes. Choices 1 and 2 are almost equally unsatisfactory to the audience because both suggest that the talk is "canned" and there is no sense of sympathy between the listeners and the speaker. The use of notes is my personal favorite, but with manuscript there is danger of losing the place, of talking from a corner so dark the typed words are unreadable, or even of having the wind blow it away. All these have happened to me, and the first was extremely embarrassing because I was presenting an Army-Navy pennant to a steel manufacturer and the ceremonies were being recorded and broadcast simultaneously. I was nearly half a minute in finding my place, and radio listeners told me afterward they thought my silence was from the station going off the air, but there was no mistaking the record and the silence was horrible.

After these misadventures, I devised a system of small cards, the usual 3 x 5 inch index sort, and instead of words to prompt me, I marked the cards with single line sketches. The drawing shows several of the sketches on a card that I used for a talk on Navy engineering before a spring banquet meeting of the A.I.E.E.

To interpret, the open book at the top of the card reminds me of how I became electrical engineer of the Pearl Harbor Navy Yard in no lessons and one night.

The second sketch, portraying badly eroded areas of the interior of a condenser tube, leads into a discussion of tube trouble in the hot waters of the South Pacific.

The man under the shower recalls my one and only attempt at evaporative cooling as applied to a destroyer's wardroom.

The last two caricatures pertain, respectively, to a tur-

bine incident, and to the jail that awaits government engineers who spend government money before Uncle Sam approves.

Obviously, three or four cards such as this will keep a speaker on the track for at least 20 minutes, the audience seldom sees them, and each sketch yields its meaning to a single fast glance. The fact is, as we stand on a platform, our need is for prompting in ideas not words; the words always come to suit the idea.

Many of us who are not professional speakers, and a few who are, run into stagefright. My personal technique for overcoming it, being non-professional, is quite simple. I just assume a what-the-hell attitude, which means I didn't ask for the job, and my listeners will have to take me as I am, and if anybody ought to worry about it, it's the people who got me into this talk, and not I. So I just do the best I can and let it go at that.

This attitude of I-don't-worry, is wonderfully helpful when, after starting to speak, we unexpectedly find ourselves being heckled by one thing or another, living or inanimate. For example when Panama's screaming bird set out to scream me right off the platform, instead of ignoring the competition as some professionals recommend. I faced the situation squarely and I said to the audience:

"Look here: either that bird likes what I am saying and is applauding, or he doesn't like it and is trying to shout me down. Either way I can't talk over him, so will somebody please chase him out of the tree?"

After the bird has been ejected I resumed my talk. but not one minute before. I just stood there quietly and waited, and the audience sat quietly and waited too.

A notorious, although inanimate heckler, is the microphone. I once was speaking for the Navy outside the capitol building at Columbia, South Carolina, and no sooner did I begin to talk than that electronic sorcerer took over the show. It squealed, whistled, burst half the ear-drums within range, then whispered so mysteriously that even those in the first row could not hear. After some minutes of this I turned the thing off and pushed it aside.

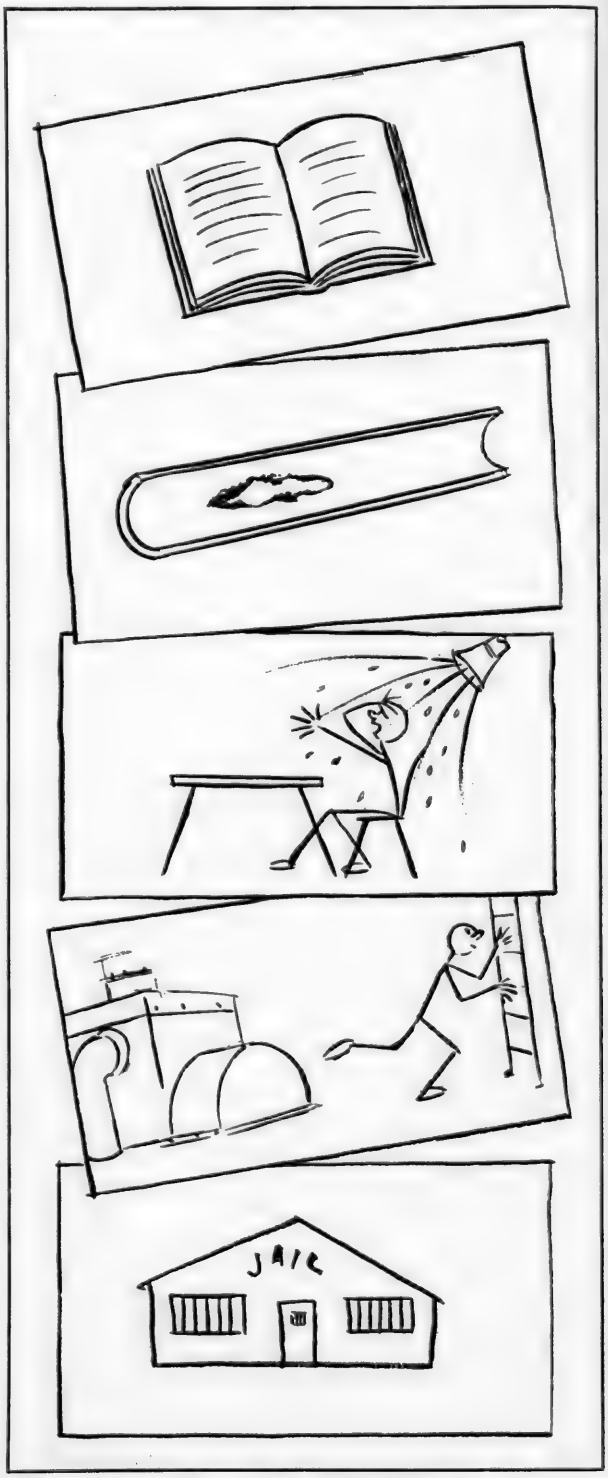
"If you want to hear me," I informed the audience, "you'll just have to come closer. I can't make as much noise as that microphone, but I can sure enough make more sense."

They laughed and moved in, and if they had to listen more attentively than they had expected, I don't think that was bad, either. Mark Twain never had a mike, and the records indicate plenty of people heard him anyway.

This technique of frankly acknowledging a difficult situation and then calling on the audience for help seems to be an effective approach; at least it has worked for me. Certainly it binds the speaker closer to his listeners, and they gain the feeling that they, as well as the speaker, are in on the act.

Every time we agree to speak, we accept one kind of risk that is common to professionals and amateurs alike—the loss of voice. This loss at a critical moment comes not only from coughs, colds and stagefright; we can talk ourselves into silence just by being sociable. To illustrate, I once rode a hundred miles with the officers of an engineering organization in a noisy automobile, to make a speach at their annual banquet. We were strangers to each other, and to put me at ease, they talked with me continually for more than two hours of 60 mile an hour riding. By the time we reached the hotel, I was hoarse from shouting over the road noises, but there was no time to relax. Instead I was introduced to a cocktail party, where a hundred men were talking all at once, and I was expected to be sociable and talk, too.

Eventually we sat down to the banquet table, and by that time I was all but voiceless and wondering whether I should whisper my speech a sentence at a time to my neighbor, who was bellowing like a bull and have him



Crudely drawn 3 x 5 index cards are used by the author instead of written notes.

retail it to the assembled guests, or perhaps just high-tail it through the back door for home. Amid my indecision the soup was served, and thereupon I made a discovery important to all speakers, simply that hot fluids descending the gullet relax the vocal cords and seem to give them new life. I followed the soup with hot coffee, several cups of it, and when I began to talk everything was fine and the waiters could hear me clearly at the far end of the hall.

Since that night, I drink something hot before speaking, whenever a hot drink is available, and I'm not particular whether it is soup, coffee, or tea. As an alternative, a throat lozenge dissolved in the mouth shortly before speaking, is helpful also in relaxing tired or scratchy vocal cords.

Engineers, and probably all others who agree to make a public address, should be sure to reach the scene early. In these few comparatively quiet minutes is the opportunity to judge the acoustics of the place, to check the microphone if any; to note the presence or absence of a lectern, to discover if you must talk from under a spotlight or in the dark, and in general to get the feel of the surroundings. Arriving late can have the speaker in a flurry, wondering what he has forgotten; he is perhaps a little breathless, and certainly undesirably tense. All this I know from experience.

The trick in being early is simply to start in time. Once I was scheduled to give an engineering broadcast from the Brooklyn Broadcasting Company, and I was so concerned studying my speech that afternoon, I forgot all about time; the studio was obliged to postpone my talk for 15 minutes. Even so, I arrived in a breathless state from running up three flights of stairs, having missed the elevator, and my first remarks on the air were delivered as though I had just finished a four minute mile.

"Next time," I apologized, "I'll be early."

"There won't be any next time," said the studio, and there wasn't. But I've never been late for a talk since.

A fundamental rule for good speaking is this: if we are willing to speak publicly at all, we should speak often, whenever we are asked. Good speakers generally are made good by practice, and if we agree to undertake the practice, we can learn to do a public stint passably well, even if we are a notoriously inarticulate breed. The results to ourselves of course, are quite beneficial professionally; we learn to express our ideas with a sharp focus, and people consider we have mastered our profession because we can talk about it intelligently. In fact, a successful talk on engineering, anywhere, improves the status of engineers everywhere.

All of our talks are not equally successful, the mood and sympathy of the audience, on which so much depends, being unpredictable. However we engineers who undertake to make a speech have the tools to shape it successfully on our part, if we simply use them in this order:

1—Talk only on subjects we know thoroughly.

2—Arrange our materials in the ho-hum, why bring that up, for instance, so what? sequence.

3—Use card pictures to prompt us instead of memorizing, or reading, or trying to follow a manuscript at irregular intervals.

4—Deliver our talk in a relaxed, I'm-not-worrying attitude.

5—Acknowledge difficulties when they occur, and ask the audience to help, as appropriate.

6—Give some thought to our vocal cords before commencing to speak, and relax them with a hot drink or a throat lozenge.

7—Accept all the invitations to speak that we can.

8—Be early on the scene.

If we follow these rules, the applause that follows our talk is quite sure to be sincere, and could, at times, be enthusiastic.

Natural Gas Supply Shows Good Reserve

The proved reserve of natural gas as of January 1, 1955, was 5994 trillion cubic meters. This statement was made in a paper by G. O. Oberfill and T. W. Legatski that was presented before the fifth World Power Conference.

The proved reserve although widely distributed over some 28 states, is mainly concentrated in the southern area of the mid-continent where the five states of Texas, Louisiana, New Mexico, Kansas and Oklahoma contribute over 88% of the total reserve. The state of Texas alone accounts for 50% of the present proved reserves. The principal reserves are concentrated in the Permian basin gas fields of West Texas and Southeastern New Mexico, the Panhandle-Hugoton areas of Texas, Oklahoma and Kansas, the Gulf Coast, East Texas, and the fields of Northwestern New Mexico. Lesser deposits in other areas are of more local than national importance.

Although the discovery rates in recent years have resulted in additions to reserves of a magnitude more than sufficient to offset the withdrawals, a still higher discovery rate will be needed in the future to insure a continuing reserve of the magnitude required by this growing industry. Expanding markets are providing some of the incentives for more intensive exploration efforts, not only in the currently important gas producing states, but also in areas with little or no production. In these latter cases, the network of pipelines which is continually being extended is an added incentive in that early markets for new production are assured through the easy access to existing pipelines.

No attempt was made to forecast the probable ultimate reserve of natural gas in the United States. However, if past history can be accepted as an indication, much gas remains to be discovered and it will be discovered under the proper incentives. An ultimate reserve double that of all past discoveries is not inconceivable. In fact, there is much reason to believe that such a figure is far too conservative. An ultimate reserve of that magnitude should give assurance that the natural gas industry will continue to be an important source of the ever mounting demand for energy.

The natural gas industry of the United States is currently the source of one-fourth of our total energy input. The present, annual marketed production of natural gas is approximately 241 10^9 cubic meters.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Emergency Devices for Protection of Laboratory Personnel

SINCE World War II, there has been a significant increase in the construction of research laboratories. This has brought with it, special engineering problems in meeting the services required. In research laboratories, considerable flexibility is offered in the design of water, waste and gas facilities.

Research is a dangerous type of effort because it involves experimentation with untried materials, compounds and procedures. Therefore, certain safety factors must be incorporated into the design of the building. Thus, prescribed safety factors include structural provisions for buildings in which blasts or explosions can occur; specialized fire protection for buildings where spontaneous combustion or flash fires is a potential hazard; where highly corrosive liquids are handled, attention must be given to the proper design and specific piping materials and equipment that can safely handle and dilute such liquids.

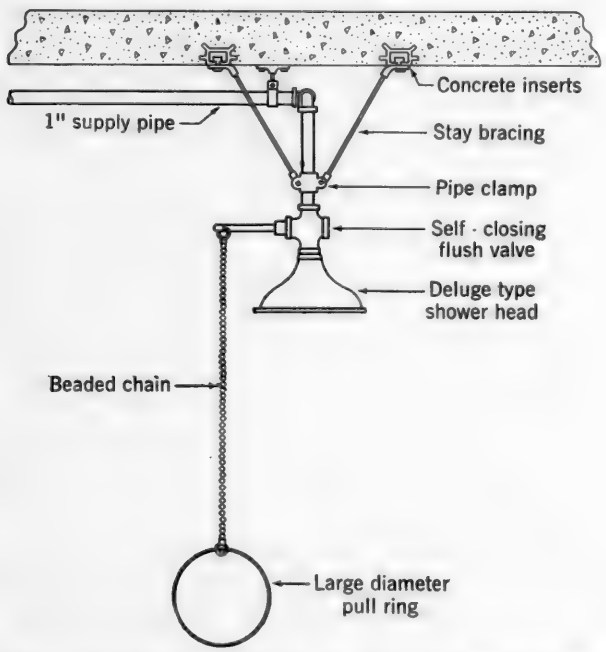


Fig. 1. Typical arrangement of emergency shower supported from underside of floor slab.

Laboratory personnel, too, must be protected against the hazards connected with their experiments. Accidental splashing or dousing by a highly concentrated form of acid or caustic solution can cause severe and sometimes fatal injury to the technician involved. There are a number of emergency devices designed as emergency safeguards for laboraory personnel should such an accident occur.

Emergency Measures

Many different types of acids, chemicals, alkalis, radiological, bacteriological and biological materials, as well as other contaminants, are regularly used in laboratory work. Although, extreme care is generally exercised in the handling of this material, accidental spilling or splashing can still occur. There is always the possibility that a mixture of ingredients will erupt and splash the technician. When this happens, it is necessary to act quickly in removing such substances from one's clothes and body before it can react on the skin. As the first step of treatment must be taken immediately, the devices for emergency protection must be close at hand. Water in generous quantities is regarded as the most favorable means for diluting or washing away the dangerous chemicals and solutions. The device furnishing this water is called an emergency shower. It should be located as close as possible to the laboratory for convenience and to speed emergency treatment.

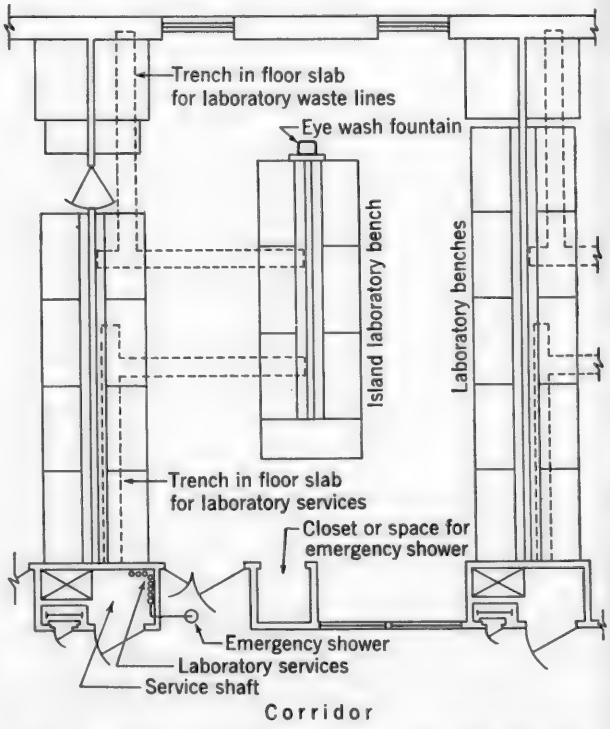


Fig. 2. Two-module laboratory room showing location of the emergency shower and eye wash fountain.

Emergency Shower

An emergency shower is a large single shower or a combination of small shower heads, so arranged, that when it is activated, it will quickly douse a person with water. The shower is usually located in a position where a person that has been splashed, can find it with his eyes closed.

Figure 1 illustrates a basic type of emergency shower. It shows a single large diameter shower head known as a deluge type head for it permits a large volume of water to be discharged.

The piping is rigidly fastened to the underside of the slab or ceiling construction. A large diameter ring, which a person can hook with his arm is used to activate the shower. Many different arrangements with regard to installation are possible with this unit. Likewise, several different methods for activating the shower may also be utilized.

Location of Emergency Showers

The emergency shower should be placed as close as possible to the point of contact or contamination by the dangerous materials. Prescribed locations are either in the laboratory itself or directly outside the laboratory, near the door.

Figure 2, suggests locations where an emergency shower might be placed. One recommended position is

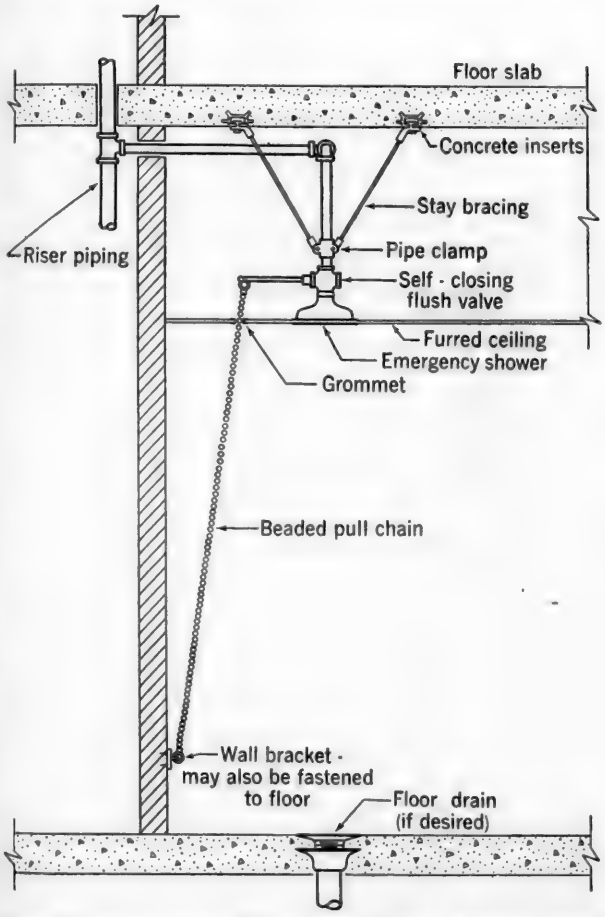


Fig. 3. Arrangement of emergency shower for condition shown in Fig. 2.

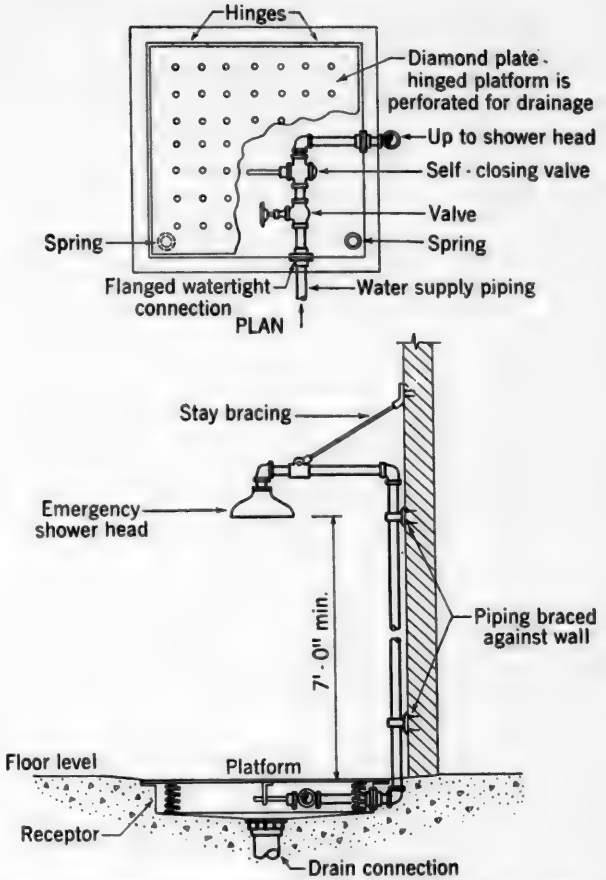


Fig. 4. Typical arrangement of a platform type emergency shower.

in the laboratory as shown while another position is directly outside the laboratory. The laboratory plan illustrated is a rather typical layout of a 2 module laboratory and is presented only for an example. The emergency shower is placed outside the laboratory when, because of the hazardous nature of the work being conducted, splashing would intensify the danger to personnel. In either of the locations, the showers are easily reached by a person, in need of its benefit. The eye wash fountain has also been included in Fig. 2, and will be discussed later.

Types of Emergency Showers

There are several different types of emergency showers currently being used with a great deal of success in research laboratories. The following are basic and are shown to point out (1) the application of this emergency protection and (2) to suggest the range of specific needs to which the showers may be adapted. The basic types are deluge, platform, swing gate and swing gate with partition.

Deluge type. This type of protection, Fig. 3, can be employed inside or outside of the laboratory, as desired. Here, it is assumed the position is outside the laboratory, in a similar manner to that shown in Fig. 2. The shower head is a deluge type that can be mounted flush with a furred ceiling. The valve and piping in this case are all concealed. As a person leaves the room, he has only to pull on the chain and the necessary water

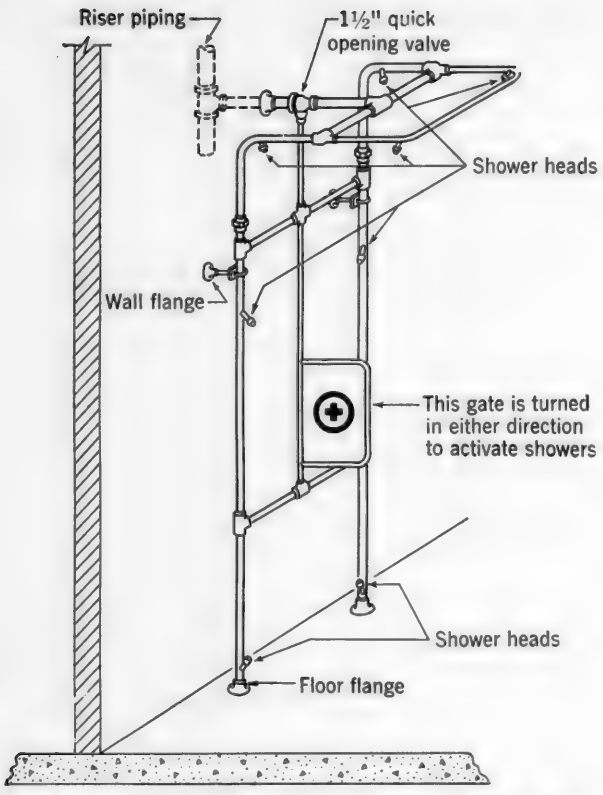


Fig. 5. Arrangement of an emergency shower unit that utilizes individual shower heads.

protection is available. A floor drain may be added or omitted at the option of the owner or engineer. Generally, a floor drain is not included since the shower is only for emergency purposes and therefore when it is used, the water dispensed on the floor is easily mopped up. Moreover, odors from a floor drain can be a hazard in itself unless the trap water seal is frequently replenished.

Platform Type. Here is a shower, Fig. 4, that might be included in the laboratory. It is only necessary to step on the platform to activate this shower. This emergency shower consists of a drain connected receptor with a perforated platform that is hinged on one side while the other side rests on springs. The activating valve and the piping and control valve are installed in the receptor space for ease of inspection and maintenance. If required, a shield or partition may be placed in front of the unit to prevent or limit the area that will be splashed with water. This type of an emergency shower operates in a very favorable manner and offers the complete protection sought.

Swing Gate Type. This is an emergency shower that can also be installed in or outside of the laboratory. Figure 5 represents a detail of its method of operation. The unit illustrated consists of 8 shower heads, so arranged to completely envelop a person's body with water. It is necessary only to swing the gate in either direction to activate the showers.

Swing Gate Type with Partition. This type unit, Fig. 6, operates in a manner equal to that shown in Fig. 5, with the exception that a partition or shield has been added in front of the shower unit to prevent the water from splashing beyond a confined area. Entrance to the shower is gained from both sides and the shower is activated by swinging the gate in either direction. A floor drain of course, can be added or omitted as desired.

Water Supply

Emergency showers and their location have been discussed and a few types illustrated. Now it is important that some attention be given to the piping sysem supplying water to the showers.

It is always preferable to utilize a potable water supply for the showers. Very often, in research laboratories, the water supply is separated into two systems, a potable water system and a process water system. The potable supply is used for all the domestic needs of the building while the process water is used for all the experimental work in the laboratories.

Let us assume that our laboratory building has both systems and that the water for the emergency showers is supplied from the potable system. A typical piping system would then be similar to that shown in Fig. 7.

The system shown supplies both the emergency showers and the eye wash fountains. The sizing of the pipe is based on the particular type of actuating valve used and the volume of water needed by the shower heads. Sizing tables included in the manufacturers' catalogs offer recommended piping sizes. The size of the general piping need not be excessive since it is rare that more than one emergency shower will operate at one time.

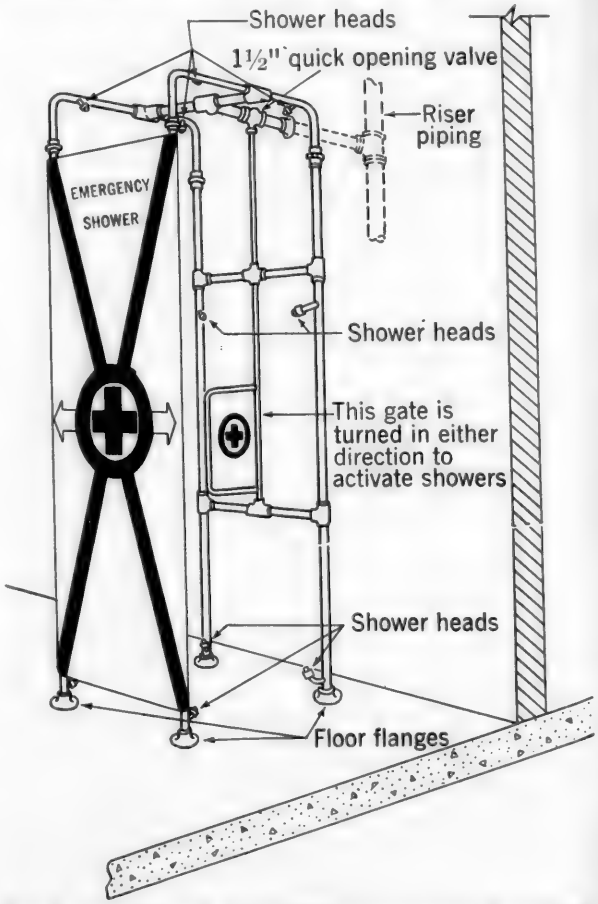


Fig. 6. Arrangement of a shielded emergency shower unit that utilizes individual shower heads.

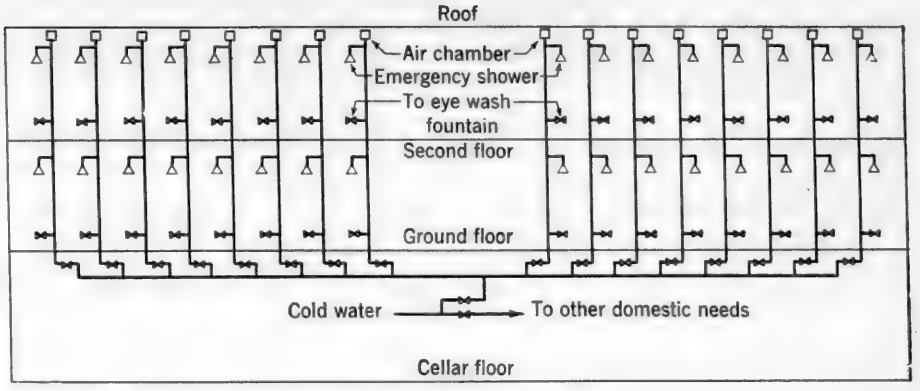


Fig. 7. Arrangement of water risers supplying emergency showers and eye wash fountains.

A water hammer arrestor is included at the top of each riser line to absorb the hydrostatic shocks that water hammer in the line can generate. Self closing and quick opening valves contribute to water hammer and, therefore, the arrestors will not only absorb the shock but will also prevent the piping clatter associated with the shock. With careful design and installation, this system can be counted upon to function in a most favorable manner when the need arises.

Temperature of Water

When the installed piping system is similar to that shown in Fig. 7, the water contained in the lines will warm up to room temperature. Even though a limited number of plumbing fixtures are supplied by the line, the temperature of the water will still remain rather warm for use.

Sometimes, however, for reasons of economy or otherwise, the emergency showers are connected to the process cold water line serving the laboratories. In this event the water is continually running through the lines and the water temperature is cold. When one is splashed with a dangerous liquid to some extent there is personal shock. A dousing by the emergency shower at this time, although it does remove the caustic material, can also intensify this shock. Cold water can be especially startling to a person utilizing an eye wash fountain.

Frequently, the laboratory staff requests that water of a controlled temperature be maintained in the piping system for the emergency showers. If the installed system is similar to that illustrated in Fig. 7, there is no particular problem. If the water is supplied from lines that are continually running, special attention is necessary to temper the water. There are a number of ways that tempered water can be furnished in a practical and economical way. One way is to provide a separate riser that supplies only the emergency showers and eye wash fountains. This method offers a riser through which water will not circulate, thus allowing the water to reach room temperature. When the emergency shower is used, the first good dousing will be with warm water before the cold water can reach the point of discharge. The engineer designing the system can devise a method that best suits his needs.

Eye Wash Fountains

Whenever emergency showers are needed, eye wash fountains are also generally required. Eye wash fountains are intended primarily for protection of the eyes of the laboratory workers.

Should an acid or contaminant accidently splash into a person's eyes, every second counts in the speed at which the matter can be washed from the eyes. There are different styles of eye wash fountains. Basically, they all function in the same manner. The units are equipped with two jets or sprays that create a gentle flow of water. The person has only to lower his head into the fixture and open his eyes, the gentle flow of the water will thoroughly wash away the dangerous material. These units are often equipped to offer both hand and foot activation. This provision is important because it is often necessary to assist a person to the unit, and to hold his face in position. In this instance, the foot pedal is employed by the person doing the assisting.

Although this article was confined to research laboratories, the units illustrated have a much wider application inside and outside the building in many industries.

Research work with radioactive materials has opened an ever greater need for this type of protection. In this field, water is used for decontamination purposes, and its immediate application is often as important as for the other hazardous materials previously mentioned.

Credits

The units illustrated in Figs. 3 and 4 are manufactured by the Speakman Co., Wilmington, Del.; units shown in Figs. 5 and 6, by the Logan Co., Glendale, Calif.

1956 Annual Index

The annual index to the 1956 issues of AIR CONDITIONING, HEATING AND VENTILATING has been completed. Subscribers may obtain copies by requesting the 1956 Index on a postcard.

DEGREE-DAYS FOR NOVEMBER, 1956

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 29th Year of Publication of Monthly Degree-Day Data

City	November			Season to November 30, incl.*		
	1956	1955	Normal	1956	1955	Normal
Abilene, Texas (A)	386	374	350	422	450	503
Albany, New York (A)	749	821	780	1475	1382	1362
Albuquerque, New Mexico (A)	715	590	630	910	728	858
Alpena, Michigan (C)	857	942	864	1633	1590	1609
Anaconda, Montana (C)	(a)	1250	951**	(a)	2140	1933**
Asheville, North Carolina (C)	586	605	552	865	888	864
Atlanta, Georgia (A)	436	433	393	490	571	511
Atlantic City, New Jersey (C)	527	557	507	780	739	766
Augusta, Georgia (A)	363	396	282	422	534	341
Baltimore, Maryland (C)	469	600	489	757	791	725
Billings, Montana (A)	820	1224	876**	1385	1831	1567**
Binghamton, New York (C)	690	793	735	1301	1268	1304
Birmingham, Alabama (A)	436	450	396	500	635	532
Bismarck, North Dakota (A)	1032	1494	1098	1804	2247	1923
Block Island, Rhode Island (A)	571	629	591	1002	964	1009
Boise, Idaho (A)	883	875	762	1431	1430	1286
Boston, Massachusetts (A)	560	685	618	1064	1077	1010
Bozeman, Montana (C)	(a)	1250	1006**	(a)	2117	1993**
Buffalo, New York (A)	688	788	753	1196	1262	1308
Burlington, Iowa (A)	749	919	765	969	1314	1184
Burlington, Vermont (A)	807	878	858	1585	1542	1551
Butte, Montana (C)	(a)	1279	923	(a)	2240	1922
Cairo, Illinois (C)	507	564	492	562	750	681
Charleston, South Carolina (C)	250	225	214	266	267	248
Charlotte, North Carolina (A)	449	442	438	582	598	592
Chattanooga, Tennessee (A)	514	536	477	625	766	670
Cheyenne, Wyoming (A)	989	1035	897	1570	1726	1715
Chicago, Illinois (C)	683	811	696**	895	1109	1098**
Cincinnati, Ohio (C)	556	638	567	699	860	831
Cleveland, Ohio (A)	665	785	1057	1022	1157	1114
Columbia, Missouri (A)	635	742	654	747	1012	978
Columbia, South Carolina (A)	372	380	308	440	511	384
Columbus, Ohio (C)	634	747	654	881	1068	1012
Concord, New Hampshire (A)	799	857	849	1654	1569	1568
Concordia, Kansas (C)	700	818	687	869	1114	1019
Dallas, Texas (A)	355	347	299	369	401	352
Dayton, Ohio (A)	697	793	693	974	1137	1090
Deer Lodge, Montana (C)	(a)	1263	1055**	(a)	2253	2187**
Denver, Colorado (A)	829	857	771	1174	1319	1316
Des Moines, Iowa (A)	807	1008	798	1072	1425	1252
Detroit, Michigan (A)	716	811	747	1128	1195	1224
Devils Lake, North Dakota (C)	1121	1520	1197	2035	2436	2127
Dodge City, Kansas (A)	688	765	669	832	1018	971
Dubuque, Iowa (A)	889	1015	882	1301	1544	1475
Duluth, Minnesota (C)	1097	1273	1092	2005	2164	1092
Elkins, West Virginia (A)	751	825	726	1242	1310	1260
El Paso, Texas (A)	494	317	390	559	351	460
Ely, Nevada (A)	1025	994	894	1821	1799	1683
Escanaba, Michigan (C)	893	995	933	1660	1676	1735
Evansville, Indiana (A)	623	682	570	799	948	844
Fargo, North Dakota (A)	1025	1376	1122	1721	2141	1923
Fort Smith, Arkansas (A)	499	502	435	541	647	575
Fort Wayne, Indiana (A)	739	861	759	1102	1259	1243
Fort Worth, Texas (A)	372	356	299	395	411	357
Fresno, California (A)	347	426	345	482	480	431
Galveston, Texas (C)	147	148	131	147	152	131
Grand Junction, Colorado (A)	914	888	792	1203	1200	1161
Grand Rapids, Michigan (A)	755	886	822	1241	1372	1428
Green Bay, Wisconsin (A)	935	1028	945	1602	1689	1643
Greensboro, North Carolina (A)	551	538	510	798	780	741
Greenville, South Carolina (A)	458	442	411	614	605	552
Harrisburg, Pennsylvania (A)	631	718	630	1072	1042	1007
Hartford Connecticut (A)	698	754	699	1433	1190	1184
Hatteras, North Carolina (C)	264	287	244	273	336	307
Havre, Montana (C)	885	1539	1023	1633	2364	1857
Helena, Montana (A)	967	1355	999	1691	2217	1936
Houston, Texas (C)	174	190	162	174	202	162
Huron, South Dakota (A)	970	1269	975	1501	1886	1596
Indianapolis, Indiana (A)	711	820	705	958	1171	1090
Jackson, Mississippi (A)	377	385	310	407	520	379
Kansas City, Missouri (A)	622	740	621	702	940	905
Knoxville, Tennessee (A)	524	567	498	630	788	710
La Crosse, Wisconsin (A)	913	1057	921	1339	1585	1520
Lander, Wyoming (A)	1068	1138	1050	1685	1834	1926

(a) Data not available.
*Heating season cumulative, from Sept. 1.
**Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company. Tacoma figures through the courtesy of the Tacoma News Tribune.

Degree-Days for November, 1956 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 29th Year of Publication of Monthly Degree-Day Data

City	November			Season to November 30, incl.*		
	1956	1955	Normal	1956	1955	Normal
Lewiston, Maine (O)	802	788	876	1632	1464	1542
Lincoln, Nebraska (C)	719	914	741	917	1246	1130
Little Rock, Arkansas (A)	433	461	405	466	585	525
Livingston, Montana (C)	(a)		864**	(a)		1614**
Los Angeles, California (C)	42	144	140	76	208	198
Louisville, Kentucky (A)	624	653	579	818	887	862
Lynchburg, Virginia (A)	575	859	951	883	859	865
Macon, Georgia (A)	348	345	280	376	460	343
Madison, Wisconsin (A)	870	974	864	1288	1487	1420
Marquette, Michigan (C)	920	1026	933	1645	1762	1712
Memphis, Tennessee (A)	439	487	432	487	645	575
Meridian, Mississippi (A)	395	398	338	434	548	428
Milwaukee, Wisconsin (A)	840	939	831	1315	1416	1393
Minneapolis, Minnesota (A)	920	1173	960	1393	1732	1576
Moline, Illinois (A)	790	914	786	1088	1341	1245
Montgomery, Alabama (A)	373	354	304	399	486	373
Nashville, Tennessee (A)	512	574	471	595	788	647
New Haven, Connecticut (A)	639	695	663	1167	1078	1119
New Orleans, Louisiana (C)	186	189	141	186	203	146
New York, New York (C)	545	627	561	863	839	863
Newark, New Jersey (A)	565	639	603	926	888	951
Norfolk, Virginia (A)	422	411	408	512	533	569
North Platte, Nebraska (A)	880	1063	846	1315	1652	1391
Oak Ridge, Tennessee (C)	493	610	550	562	877	775
Oakland, California (A)	329	353	336	573	638	569
Oklahoma City, Oklahoma (A)	531	595	459	603	751	620
Omaha, Nebraska (A)	752	964	783	991	1334	1202
Parkersburg, West Virginia (C)	596	665	600	865	951	928
Peoria, Illinois (A)	747	873	759	950	1245	1184
Philadelphia, Pennsylvania (C)	491	551	516	741	723	768
Phoenix, Arizona (A)	214	181	182	261	182	195
Pittsburgh, Pennsylvania (C)	595	693	612	905	998	966
Pittsfield, Massachusetts (A)	816	887	843	1642	1602	1599
Pocatello, Idaho (A)	1019	960	873	1707	1652	1543
Portland, Maine (A)	806	861	825	1632	1608	1539
Portland, Oregon (C)	569	656	534	979	1044	899
Providence, Rhode Island (A)	630	711	672	1218	1153	1160
Pueblo, Colorado (A)	836	804	771	1106	1143	1228
Raleigh, North Carolina (A)	489	500	387	676	696	515
Rapid City, South Dakota (A)	950	1203	891	1433	1802	1584
Reading, Pennsylvania (C)	604	657	588	974	926	930
Red Bluff, California (A)	273	395	319	410	445	378
Reno, Nevada (A)	838	762	744	1482	1398	1352
Richmond, Virginia (A)	519	555	498	740	750	741
Rochester, New York (A)	715	812	759	1296	1337	1332
Roswell, New Mexico (A)	603	500	501	710	634	665
Sacramento, California (C)	294	361	321	417	417	413
St. Joseph, Missouri (A)	703	863	600	854	1167	882
St. Louis, Missouri (C)	570	650	570	655	868	810
Salt Lake City, Utah (A)	915	873	771	1372	1367	1240
San Antonio, Texas (A)	230	222	201	233	250	226
San Diego, California (A)	75	154	147	112	209	223
Sandusky, Ohio (C)	683	778	684	998	1104	1077
San Francisco, California (C)	172	273	237	432	630	475
Sault Ste. Marie, Michigan (A)	953	1049	1005	1866	1900	1942
Savannah, Georgia (A)	302	283	225	330	370	263
Scranton, Pennsylvania (A)	736	813	693	1371	1286	1197
Seattle, Washington (C)	567	708	540	1093	1245	1003
Sheridan, Wyoming (A)	915	1238	957	1557	1914	1774
Shreveport, Louisiana (A)	334	351	305	357	430	358
Sioux City, Iowa (A)	838	1078	885	1149	1515	1418
Spokane, Washington (A)	963	1101	879	1684	1888	1592
Springfield, Illinois (A)	706	806	666	887	1151	981
Springfield, Missouri (A)	627	695	615	735	948	925
Syracuse, New York (A)	710	790	714	1308	1272	1227
Tacoma, Washington (C)	612	709	579	1168	1264	1131
Toledo, Ohio (A)	745	843	756	1191	1282	1245
Topeka, Kansas (C)	639	771	630	744	1006	914
Trenton, New Jersey (C)	565	633	582	928	892	922
Tulsa, Oklahoma (A)	509	560	462	550	689	632
Utica, New York (O)	837	834	781**	1438	1347	1393**
Valentine, Nebraska (A)	957	1162	891	1447	1748	1497
Walla Walla, Washington (C)	795	891	675	1229	1335	1076
Washington, D. C. (C)	520	573	510	757	755	773
Wichita, Kansas (A)	628	718	597	721	933	848
Williston, North Dakota (C)	981	1497	1101	1782	2294	1967
Winnemucca, Nevada (A)	922	921	822	1631	1641	1510
Yakima, Washington (A)	890	1008	807	1532	1692	1403

For footnotes, see page 100.

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Supermarket Workers Kept Warm by Localized Radiant Heating System

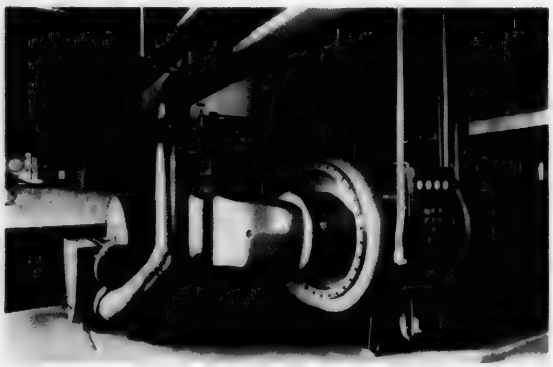
PROBLEM: If a supermarket is kept warm enough for the store personnel working without coats, it will be too warm for customers wearing heavy clothing who come in from outdoors on a cold day.

SOLUTION: This dilemma was solved at the new Hinky Dinky Supermarket in Omaha, Neb., by installing a localized radiant heating system in the concrete floor. This system runs under the floor of the cashier's office, manager's office, check-out area, public restrooms, and meat-packaging rooms, and is controlled by a thermostat attached to one of the check-out stands.

RESULTS: The store space temperature, thermostatically controlled by warm-air blowers, can be reduced from 5 to 10 deg F resulting in a considerable saving in fuel cost. Personnel and customer comfort requirements are both satisfied.

Production, Personnel Comfort Promoted by Air Cooling and Cleaning System

PROBLEM: For years soot and smoke-laden air lowered quality in the carding and spinning departments of the Highland Park Manufacturing Co., Charlotte, N. C. In addition, employee absenteeism was above normal during hot summer months.



SOLUTION: The installation of a centrifugal compressor of the Trane Company, La Crosse, Wis., providing 322 tons of refrigeration (see illustration) and an air cleaning system resulted in 1000 gpm of chilled water at 46.6 deg F supplied to air washers in both the carding and spinning departments. Water supply to the chiller is from a redwood, induced draft cooling tower.

RESULTS: Hundreds of mill employees are now kept comfortable and on the job during hot spells, while the filtered, washed air is providing lower maintenance costs, improved yarn quality, and fewer seconds.

Warm Condenser Water Reheats Hospital Air

In the sprawling, frame buildings of the Mitchel Air Force Base Hospital on Long Island, 70 tons of packaged air conditioning units from Typhoon Air Conditioning Co., Brooklyn, N. Y., were installed by the Kool-Flow Co., Inc., of Brooklyn.

Typical of the special needs of a hospital is the requirement in the contagious disease ward for 100% fresh air. There is no recirculation of air; all conditioned air introduced to the ward is exhausted to the street.

All air introduced into wards throughout the hospital is tempered, to limit discharge air temperature at the grille, as shown, and at the same time maintain comfortable humidity. Reheat is achieved through the piping of warm water from condensers directly into reheat coils and then to the cooling tower.

Adequate dehumidification and absence of draft is achieved through reduction of air quantities. Excessively high suction temperatures are eliminated by means of a back-pressure regulating valve in the suction line.

Cellular Glass Prevents Sweating In High-Humidity Weave Room

A new weave room at the Clinton Cotton Mills, Clinton, S.C., is furnished with air conditioning designed to maintain sensible temperature between 80 and 85 deg and relative humidity between 80 and 85%, optimum conditions for yarn handling. One problem that arises from the maintenance of this high humidity is the possibility of damaging condensation on the walls and ceilings of the weave room.

A 2 in. layer of cellular glass insulation, manufactured by Pittsburgh Corning Corp., Pittsburgh, Pa., was installed between the old outside face brick and a glazed tile interior wall. On the roof, 2 in. thick blocks are laid in hot asphalt over a 3 in. wood deck and covered with a 4-ply built-up roof covered with gravel.

Electrical System Renovated To Meet Air Conditioning Needs

When electrical facilities are renovated to provide modern air conditioning in an existing office structure, the new facilities must provide maximum flexibility, yet blend with the building interior; cost must be kept within reasonable bounds of operational economy; and, of necessity, much of the installation work must proceed while routine activities are carried on by office building occupants.

R. J. J. Tennant, chief engineer of the Oliver-Tyrone Corporation, Pittsburgh, Pa., encountered various aspects of these problems in designing the electrical system for new, console-type air conditioning units installed in the Henry W. Oliver Building. Although one of Pittsburgh's more modern office structures, the building was nevertheless erected prior to the advent of underfloor electrical networks and well before the growing trend to year-around air conditioning. The management decided to install air conditioning for those tenants who wanted it immediately and, at the same time, provide wiring facilities that were easily expandable to accommodate occupants who might desire the service at a later date. While there was ample space for additional conduit risers, electrical distribution from the central panels to points of service through the various offices was recognized as the problem. Frequent rearrangement of inside office partitions was a complicating factor that necessitated the use of ceilings and outside walls for ductwork.

The equivalent of more than six miles of National Electric Products Corp. steel Surfaceduct, 2⅛ inch by 1⅝ inch in size, was used to carry the distribution. From the panel board it was fitted to the inside corner walls, extended across the ceiling and mounted above the baseboards of exterior walls to serve the air conditioning units. Each duct run, presently serving five units, is a separate circuit with an individual circuit breaker at the panel board. In addition ducts were installed in rooms where air conditioning was not yet requested.

Economy of installation was achieved because the duct proved fast to mount and permitted full utilization of the lay-in method of wiring. Future benefits will be realized stemming from the system's flexibility. The removable capping of the raceway permits easy access to wiring for repair, replacement or tap-ins for additional electrical service.

Moisture Trouble in Attic Ended by Vapor Barrier Insulation

PROBLEM: Occupants of a home in New England complained of excessive moisture in the attic, even during long spells of dry weather. Windows in the living room downstairs were often wet. A new wing had been built to the house. The ground floor over the crawl space underneath the wing was dry and an asphalt-impregnated paper, which had been placed between the floor joists in the crawl space, facing the ground, was also dry. Vapor-forming combustion equipment was properly vented, and both the laundry and kitchen had minimum usage since the two people who lived in the house were away most of the day. There were no leaky pipes.

SOLUTION: Source of trouble was believed to be a flow of water vapor from the ground, through the asphalt paper and the dry concrete floor, and other materials between joists in the room above, through the ceiling and finally into the attic. The condensing of the vapor on the cold windows and in the cold attic, caused the wet condition. Infra insulation, consisting of multiple layers of aluminum foil and multiple reflective spaces, was installed beneath the joists along the entire crawl space. Ventilation was provided by leaving the door open to the crawl space.

RESULTS: In a short time, the attic became dry and the downstairs windows clear and free from condensed vapor.

Packaged Air Conditioner Occupies Unusable Space

PROBLEM: Bert's, a sundries store in Daytona Beach's new Westgate Shopping Center, had a problem because, though a modern cooling system was desired, there was no room for equipment either inside or outside the store. In addition, the shopping center owners preferred that no equipment be placed directly on the building roof.

SOLUTION: Reconnoitering the situation and premises, Arthur Rothkranz, sales engineer for Theodore M. Williams Company, Daytona Beach, Fla., air conditioning firm, came up with the "cradle" solution. As shown in the illustration, four "I"-beams were set on opposite building walls. They serve as a base for the store's atmospheric tower. From the beams extends the angle iron cradle that holds a 30-ton Chrysler Airtemp packaged air conditioner.

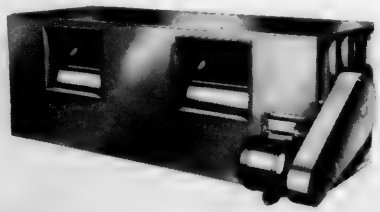
RESULTS: Supply duct runs from the unit to store and laterally the length of the store behind a curtain wall. Duct outside the building is lined with vinyl fiber glass and weatherproofed with mastic. Return duct runs from a bank of return grilles set in the wall. There is no perceptible sound from the cradled unit entering the store. Performance of the somewhat unusually arranged system has been reported as perfect and the unit is not occupying usable space.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on page 89 for securing additional information on new equipment and materials described in this department.

Quiet, Compact Cabinet Fan

A new, large volume cabinet fan for operation at low noise level and space-saving installation in buildings with low ceilings has been announced by the Trane Company, La Crosse, Wis.



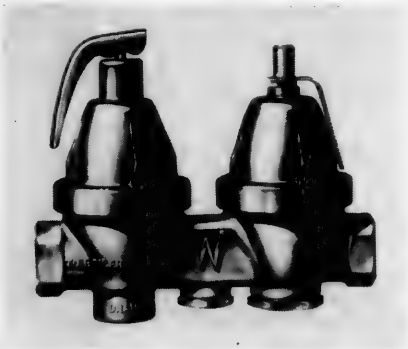
Ideally suited for industrial and commercial applications, the cabinet fan can be used in air moving systems for supply, exhaust, or recirculation of air. It is available in 12 sizes ranging from 600 to 34,500 cfm, with outlet velocities varying from 1,000 to 2,600 fpm.

One and two-fan models are available, with two-fan units mounted side-by-side on a single shaft to maintain a flat, compact cabinet, easily installed over doorways, in closets, or other out-of-the-way places. Bearings, drives, and motor are mounted outside the cabinet for easy access.

More information? Circle Item 1 on postcard, page 89.

Dual Control Valve

A new dual control valve for hot water heating systems incorporating a unique inbuilt ball check feature is announced by Watts Regulator Co., Lawrence, Mass. The new ball check design is said to greatly aid the contractor in servicing this type of valve, because the pressure regulator may be serviced right in the line without pulling a vacuum or draining the heating system.



Also, it is said that the company's ball type check valve feature not only prevents contaminated water from backing up into the potable water supply lines but also isolates the reducing valve from the deteriorating influences of fluctuating boiler pressures above the required minimum system pressure, thus assuring indefinite life to the automatic feed water regulator.

The reducing valve is of advanced design having high feed capacities and without sliding guides, making the valve impervious to sticking from water conditions. The relief valve features a bottom drain connection which affords an economical drain pipe hookup.

More information? Circle Item 2 on postcard, page 89.

Larger Size Water Chillers

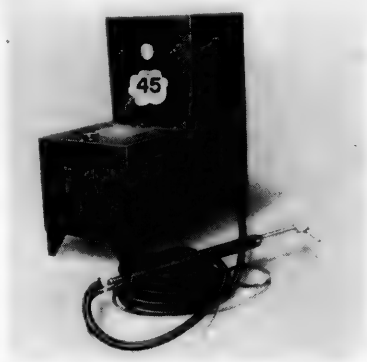
Vic Mfg. Co., Minneapolis, Minn., offers two larger versions of its air-cooled refrigerated water chiller. Respective sizes are 5 and 7½ ton. Full capacity with ambient temperatures up to 115 deg F is promised. Units have fully accessible hermetic compressors.

More information? Circle Item 3 on postcard, page 89.

Steam Cleaning Device

A new low-operating cost steam cleaner, Model 45, which will produce a steady jet of steam at 120 psi for cleaning is developed by Vapor Heating Corp., Chicago, Ill.

The steam cleaner consumes only 1¼ gph of No. 1 fuel oil to turn 45 gph of water into an effective steam cleaning jet. A ⅓-hp, 110-volt motor, with an over-load cut off, drives the positive displacement water pump. The



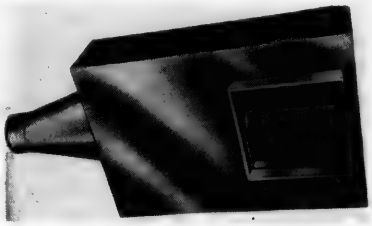
water is turned into steam as it is pumped through the coils which are heated by a selection of fuel firing. A float-control keeps an ample supply of water in the tank for the coils, and the fuel oil tank holds enough fuel to do 4 hr of steady steam cleaning.

All operating switches and controls are panel mounted on the outside of the red metal cabinet, making it easy to start, stop, and regulate the cleaner, without opening the cabinet. Two types of burners are available; one for burning kerosene or No. 1 fuel oil, another for burning city gas or propane. The standard model is not equipped with wheels; however, a three wheel kit is available and easily applied.

More information? Circle Item 4 on postcard, page 89.

High-Pressure Terminals

Agitair, a series of high pressure terminals for the control and distribution of air in high-velocity systems is announced by Air Devices Inc., New York, N. Y.



Terminals are available in a range of sizes and types for overhead or perimeter air distribution in single or dual duct applications. They feature non-clogging mixing valves, fool-proof air balancing adjustments, noise-attenuation plenums insulated with neoprene-coated glass fiber blankets, and a selection of square, rectangular, slot type and circular diffusers to distribute the air noiselessly and draftlessly.

A catalog is available, containing performance data, selection procedure, and types and sizes.

More information? Circle Item 5 on postcard, page 89.

Residential Heat Pump

A heat pump is announced by The Majestic Co., Inc., Huntington, Ind. This electric unit not only serves as a winter supply of heat but automatically changes into a summer air cooling conditioner of the remote type, in which the bulky operating parts are situated out-of-doors.

Developed for basement, slab, crawl-space, or trilevel applications, it is said to be the most versatile unit now on the market. Upflow, downflow, and horizontal flow are all available in compact design. Two sizes which are presently being manufactured are a 36,000 Btu per hr cooling with 75,000 Btu heating unit, and a 60,000 Btu cooling with 105,000 Btu heating unit. When winter temperatures drop to extreme lows, supplemental electric heat automatically comes into operation for balanced control.

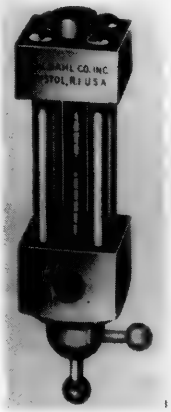
In the photograph, the taller unit, 21 x 24 x 48 in., contains the blower for hot or cold forced air distribution; the unit on the right is the remote section containing the compressor, condenser, and other outdoor operating mechanisms.

The company claims the initial cost of complete installation should be no more than the cost of a heating system using other fuel and a good summer air conditioner. The cost of operation also compares favorably. It is further asserted that the heat pump is no more complex than the simplest present-day heating and cooling system, with automatic controls designed for ease of operation by any housewife.

More information? Circle Item 6 on postcard, page 89.

Sight Flow Indicator

Development of its sight flow indicator is announced by G. W. Dahl Company, Bristol, R. I.



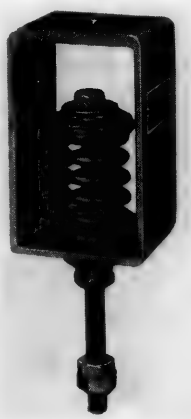
Indicator is a combination header and toggle valve for tight shut-off. This assembly is used to indicate leakage flows, or any flow which is small and requires constant checking. Since valve toggles shut in one plane, open or closed position is positively indicated by a distinctively colored ball.

A variation of design is used on purge systems, with a minute 200-to-1 rangeability needle valve being used for throttling. Flow range available is 0-2 standard cu ft per hr. A variety of barstock materials is also available.

More information? Circle Item 7 on postcard, page 89.

Spring Insulation Units

Steel spring Vibro-Hangers, for suspending disturbance-generating equipment and piping systems, and providing maximum freedom from vibration transmission, is developed by The Korfund Company, Inc., Long Island City, N. Y.



Hangers utilize a helical steel spring as the high-deflection, high-efficiency vibration isolating medium. The springs, made from oil-tempered, carbon and alloy steels, will withstand high temperatures without permanent set, and low temperatures without losing their resilience.

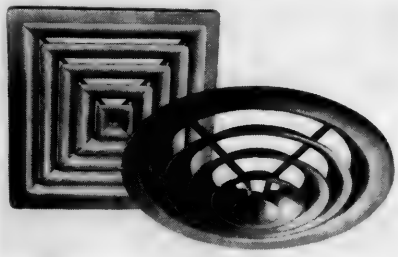
These isolation units provide the greatest deflection and load capacities now commercially available. For less exacting requirements, rubber-in-shear isolation units are supplied by the company.

The spring isolation units are supplied in a box-type housing as the Type VB, in a U-bracket housing as the Type VH, or without any housing as the Type VU. Effective load range from 50 to 3800 lb.

More information? Circle Item 8 on postcard, page 89.

Step-Down Ceiling Diffusers

New round and square step-down ceiling diffusers, available from The Auer Register Co., Cleveland, Ohio, are designed for fast, economical installation. Just four screws hold the diffuser and built-in damper assembly to the duct. The company's spring-loaded Balancing Bell



damper featured on these diffusers permits easy system balancing in addition to full shut-off without quadrant dampers.

Step-down vanes are engineered to provide the most effective air distribution pattern. Maximum free area with minimum air resistance is provided by straight edge design of the vanes. Recirculation of room air is induced by curved contour vane design.

Both the round and square styles are available without damper control for efficient use as return air faces on all perimeter systems.

More information? Circle Item 9 on postcard, page 89.

Air Release Valves

An improved line of heavy duty air release valves is introduced by V. D. Anderson Co., a division of International Basic Economy Corp., Cleveland, Ohio, for heating, piping and air conditioning contractors, engineers, and maintenance men.

Valves are automatic and continuous in operation and release air as fast as it accumulates. They are normally installed at the high points of a piping system where air pockets naturally form.

Valve body and head are of special cast iron metal. Inside the device is a rust-proof heavy-gage copper float, and a valve and seat made of corrosion-resistant heavy-duty bronze.

Valves are made in 3 different types: No. 70 in ½-in. size for pressures up to 125 psi, No. 72 in ½ and ¾-in. sizes for 250 psi, and No. 73 in 1, 1¼, and 1½-in. sizes for 250 psi.

More information? Circle Item 10 on postcard, page 89.

Split-Packaged Heat Pumps

Packaged heat pumps for year-round residential and commercial air conditioning, designed to cut both first cost and operating cost for such equipment and to reduce space needed indoors to a minimum, is announced by Carrier Corp., Syracuse, N. Y. At the same time the

company introduces a series of assemblies for field-engineered heat pump systems for larger buildings.

Called the Weathermaker, the packaged unit employs outdoor air as a source of heat and is divided into two units, with an indoor unit little larger than a room air conditioner. It requires virtually no space inside a home or commercial building, can be installed in an attic, (illustrated) basement, or top of closet, yet it can do the entire job of heating and cooling.

Company officials say the heat pump has been engineered to achieve greater efficiency over the whole range of normal heating and cooling operation, so that operating cost will run as much as 20% lower.

Two-piece design permits complete flexibility of installation and a consequent reduction in installation cost in many cases. Since the portion of the heat pump requiring outside air is located exterior to the structure, it is no longer necessary to install ductwork inside the building to bring in the air from which heat is taken. Thus sheet metal costs and any noise incident to moving large quantities of air can be greatly reduced.

The heat pump package will be introduced initially in a 5-hp model, which is expected to be the most popular size for residences and small commercial buildings. Production will begin on a larger size and eventually smaller models will be manufactured.

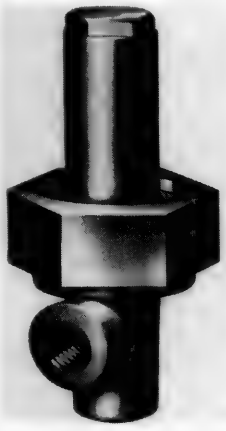
The new heat pump systems present many novel possibilities, as they may use either air or water as a source of heat.

Heat pump systems will be available in sizes ranging from 10 to 125 hp.

More information? Circle Item 11 on postcard, page 89.

Relief, Back Pressure Valves

Its new line of relief valves and back pressure valves which can be used with corrosive fluid at pressures to 1500 psi and temperatures to 250 deg F is announced by Milton Roy Co., Philadelphia, Pa.



Their top works are protected by thermoplastic diaphragms, and available in standard ¼, ½, ¾ and 1-in. sizes, these valves offer a wide range of pressure settings easily made with a screw driver. For high corrosion resistance, bodies are constructed of cast steel, 316 stainless steel, Carpenter No. 20 and Hastelloy C.

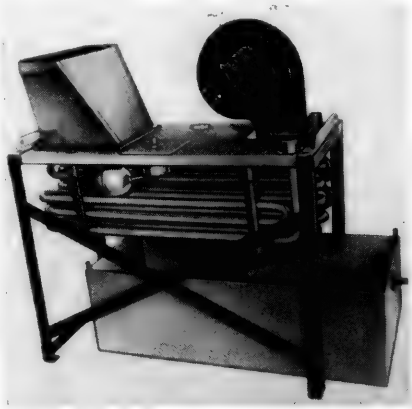
Back pressure valves are used in pumping systems where discharge pressure is lower than suction pressure. Both valves have diaphragms located between the body and bonnet. All parts below the diaphragm in contact with the fluid are constructed of materials chemically resistant to most fluids. The top works of the valve are protected by the diaphragm and never come in contact with the fluid. Corrosion problems are thus minimized.

The inherent design of the ball checks in the relief valves produces snap-action and large flow capacity. With ball checks, these relief valves open fully at the set pressure and close tightly with a very small drop in pressure below the set value.

More information? Circle Item 12 on postcard, page 89.

Central Humidifier for Homes

The Humid-i-maker, an automatic evaporative-type humidifier for buildings with hot water, steam, or warm



air heating systems, is announced by Armstrong Machine Works, Three Rivers, Mich., designed for homes, offices, greenhouses, schools, churches, and hospitals.

It operates by circulating air across the surface of heated water and into a central distribution duct.

Each unit is a closed, stainless steel tank containing submerged copper heating coils and a water-level control. A blower mounted on top of the tank circulates the air. Hot water for the heating coils is pumped from a boiler or hot water heater. A humidistat controls the blower and hot water pump. Fill water is taken from the regular soft water supply.

Humidifier can be suspended from a ceiling or mounted on a floor stand. The tank drops to make all parts accessible for cleaning, service or inspection. It comes complete, ready for installation. Includes covered tank, coils, float valve, blower, duct connection, humidistat and transformer-relay box. Optional accessories include a wrought-iron stand and a sheet metal housing.

Capacity of the Humid-i-maker is sufficient to handle nearly any size home or up to 33,000 cu ft of space.

More information? Circle Item 13 on postcard, page 89.

Stainless Steel Fountains

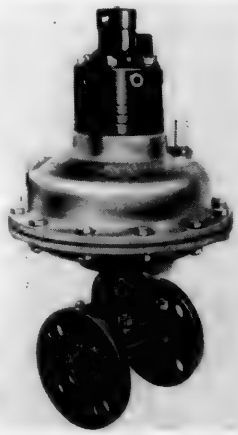
Embossing around the bubbler drilling that keeps plumbing rough-in completely above the water level line and allows the fountains to meet the most rigid sanitary codes in a line of wall mounted stainless steel drinking fountains is a feature of a line made by Elkay Mfg. Co., Chicago, Ill.

Three types are available: a fully recessed model, a semi-recessed model (illustrated), and a fully exposed unit. Recessed models have a wide back to allow for ample head room. Semi-recessed and fully exposed units are equipped with a large removable access panel.

More information? Circle Item 14 on postcard, page 89.

Air Operated Control Valves

A complete new line of air operated Saunders patent type control valves are available from Uniflow Valve Corp., Cranford, N. J.



Features of the control valves include no stem packing or stuffing box, tight shut-off, and no clogging or sticking. They are available with optional features such as handwheel type limit stops, plastic position indicators, and micro-switch attachments for actuating remote visible or audible signals.

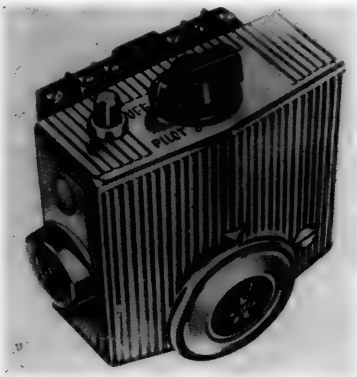
By use of the diaphragm method of closure, a positive drip-tight shut-off can be obtained. The streamlined flow area, free from pockets, grooves, or other crevices assures full flow efficiency.

The valves are available in a wide variety of body materials, body linings, and valve diaphragm materials for a multiplicity of flow control services. Valve size range is ½ to 6 in. for on-off throttling control.

More information? Circle Item 15 on postcard, page 89.

Warm Air Furnace Gas Control

Unitrol Model 400-E is an automatic gas heating control for use with warm air furnaces manufactured by Grayson Controls Div., Roebrtshaw Fulton Controls Co.,



Long Beach, Calif. It combines gas cock, thermostatic valve, and automatic pilot in a single compact unit.

Valve operates on the heat motor principle, 24 v a-c, is used with any room thermostat and has snap-action for positive, silent performance. Automatic pilot is of the 100% shut-off type.

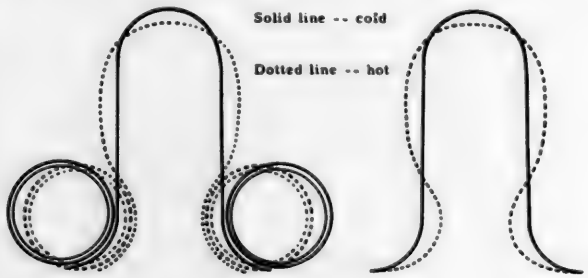
Two pipe fittings are needed to assemble. All adjustments are made from the front by removing plate.

More information? Circle Item 16 on postcard, page 89.

Corrugated Expansion Joints

Redesigned packless corrugated expansion joints for use in power, heating, industrial, and process piping applications is offered by Badger Mfg. Co., Cambridge, Mass.

Known as Service-Rated expansion joints they are available in several types which are classified according to the pressure-temperature conditions. Joints in Series 150 (illustrated left) are for higher line pressures, Series 50 (right) for lower pressures.



Major change in Series 50 is in the shape of the corrugations which form the flexing member, which gives each a more effective height for greater flexibility and more uniform movement per corrugation. In addition, the corrugation naturally assumes an all-curve shape (dotted line) under operating pressures and temperatures and actually breathes with pressure fluctuations.

Series 150 and higher also have the improved corrugation shape. However, because these joints are designed for use where there are higher line pressures, they also have reinforcing rings.

As shown in the illustration at left, tubular rings make metal-to-metal contact only in the valley of each corrugation. Design maintains hoop dimension of each corrugation and allows it to naturally assume an all-curve shape (dotted line) when under line pressure. Fabricated from wrought steel, the reinforcing rings are substantially lighter and are able to withstand higher pressures and temperatures.

Available in any weldable alloy for pipe diameters from 3 to 72 in., joints are normally equipped with internal liners to streamline flow, minimizing turbulence and high frequency vibrations. Internal liners are generally fabricated from the same material as corrugated members.

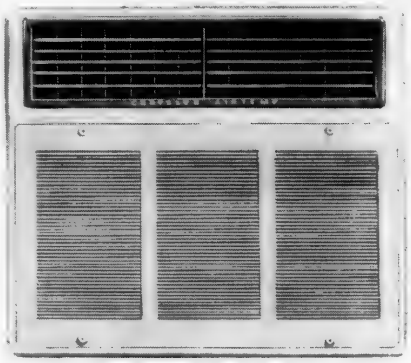
With flanged or welding ends, at slight additional cost, joints are provided with external covering shields to protect corrugations from damage and keep them free of foreign materials.

There are hinged, tandem or balanced models for installations subject to angular or lateral movement alone or in combination with axial movement. Double joints are available for applications where axial movement is in excess of the amount that can be accommodated by a single joint.

More information? Circle Item 17 on postcard, page 89.

Room Air Conditioners

Room conditioners in 3 cabinet designs, for double hung windows, casement windows, and either in-the-win-



dow or in-the-wall installation, are announced by Airtemp Div., Chrysler Corp., Dayton, Ohio.

A 1-hp model features reverse cycle heating. 12 amp, 115-volt operation. A ¾-hp model offers 7½-amp operation. The Imperial Wall-Thin unit (illustrated) is available in ½, ¾, and 1 hp.

More information? Circle Item 18 on postcard, page 89.

Insert Electric Heaters

Deliveries are being made on 230-v wall insert electric heaters, manufactured by Trade-Wind Motorfans, Inc., Rivera, Calif. Now furnished is a complete line of wall heaters for both 115 and 230-v operation.

The 230-v units are available in the same sizes and physical characteristics as the 115-v units, with 1000, 1300, and 1500-w sizes being offered. All are available with either switch or thermostat.

More information? Circle Item 19 on postcard, page 89.

Coffee Break Appliance

A water cooler that delivers both steaming hot and ice cold water, and has an accessory storage section for cups and packets of instant coffee, chocolate and soups is introduced by Refrigeration Specialties Div., Westinghouse Electric Corp., East Springfield, Mass.

Called the Hot and Cold Water Cooler the new product will be used in conjunction with many brands of instant coffee, hot chocolate and soups now available in single serving packages from many leading instant food producers.

Electrically operated and requiring no plumbing, the unit looks like a standard water cooler which uses 3 or 5-gal water bottles. However, it has two push button water taps, one for cold water and the other for hot. The hot water is produced in a 2-qt rapid heating unit which dispenses 190 deg F water. The water heater is a 1,000-watt, 60-cycle immersion type in a monel metal tank; cold water is produced with a hermetically sealed 1/6-hp compressor.

More information? Circle Item 20 on postcard, page 89.

Remote Bulb Temperature Control

Type E27A, a remote bulb temperature control, is added to the list of standard controls offered by United Electric Controls Co., Watertown, Mass. This new control contains two switches and, in many applications, may be used in place of two separate single-switch controls.

The complete unit consists of a bulb, capillary tube, bellows, and a control head. The bellows is attached to the control head and is connected to the remotely-located bulb by means of the capillary tube. Bulb, capillary tube, and bellows are all completely liquid-filled and incompressible. When heat is applied to the sensitive bulb, the liquid expands and causes a uniformly linear motion of the bellows plunger. The plunger operates the switches when the temperature reaches the points established by the control adjustments. The bellows is spring-loaded to ensure quick, accurate response to all changes in temperature.

Temperature settings are made by rotating a single-turn knob and pointer against a calibrated scale. Models are available with range spans of 100 or 200 deg F between limites of —150 and 650 deg, and with *on-off* differentials of approximately 1 and 2 deg. An adjusting screw is attached to each switch so that each switch can be adjusted individually up to a maximum span of approximately 15 deg between switch settings. This span is maintained constantly throughout the control range. Wider spans are available upon specification.

More information? Circle Item 21 on postcard, page 89.

Fractional Horsepower Motors

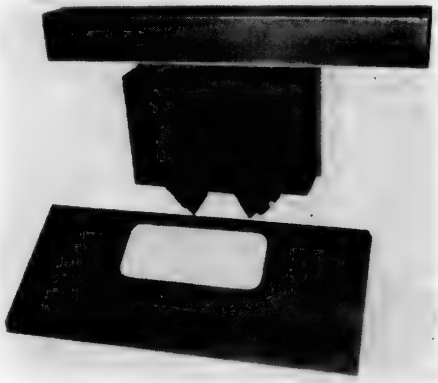
Capacitor-start and split-phase motors in rigid and resilient base models are now available in NEMA 48 frame size from Wagner Electric Corp., St. Louis, Mo. Through use of smaller, lightweight, precision-machined steel frames and cast aluminum endplates, weights of 1/6, ¼ and ⅓-hp ratings have been reduced from 3 to 8 lb.

Lubrication system permits mounting sleeve bearing motors at any angle. The bearings, lined with high tin babbitt, have anti-seizure and non-scoring characteristics, high corrosion resistance, and provide smooth performance with low temperature rise.

More information? Circle Item 22 on postcard, page 89.

Dual Duct Mixer, Distributor

Air mixing and distributing units for dual duct air conditioning, Type V3, for under window or wall mounting, and Type H, for overhead installation, usually above hung ceilings, are being marketed by Buensod-Stacey, Inc., New York, N. Y.



Self-contained volume control is automatic, requiring no outside connections or source of power. It maintains the desired supply of conditioned air entering a given room within plus or minus 5% of the predetermined amount, with variations of inlet pressure up to 4 in. wg. V3 capacity ranges from 100 to 400 cfm; that of the H unit ranges from 100 to 800 cfm. The former (illustrated) has separate distributing header with high velocity outlets and finished front cover, both of which can be varied in dimensions to suit building module size.

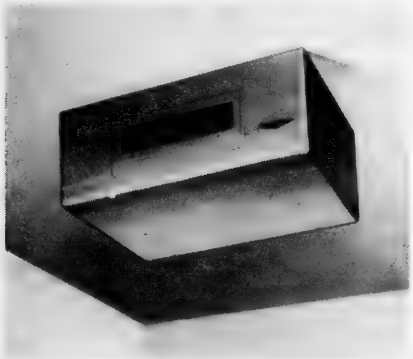
These units contain no coils, fans, filters, electric motors, or water piping. When thermostatically controlled, the manufacturer states, steady room conditions will be maintained though outside temperatures vary 40 deg in a single day.

More information? Circle Item 23 on postcard, page 89.

Overhead Type Air Conditioners

A new series of overhead remote type air conditioning units for ceiling and concealed installation has been added to the line of floor and wall type units manufactured by Fedders-Quigan Corp., Trenton, N. J.

These units are designed for overhead installation in multi-room applications such as hotels, motels, stores,



offices, public buildings, hospitals and other installations where floor and wall space is at a premium. They use remote sources of circulating hot water in winter and chilled water in summer. Only three pipes are necessary; supply, return, and condensate drain.

Fedair Model O units are housed in an attractive steel cabinet for ceiling installation. Model OR is designed for concealed installation in a closet, cove ceiling or decorative plenum.

More information? Circle Item 24 on postcard, page 89.

Concrete Drilling Machine

A drilling machine, called Kor-It, developed by J. F. Hamlin Co., San Francisco, Calif., makes obsolete the noisy, time consuming jack-hammering method of drilling through reinforced concrete, marble, and tile.

Using a General Electric NEMA 56 frame, 3450 rpm motor, the machine saws holes for such purposes as running conduit systems and piping in existing structures and for getting test cores from highways and buildings for laboratory analysis.

Needing only a 115 or 230 volt electrical outlet and a rubber hose attachment from a water tap, the cutting machine requires no special operating skills, and once the device has been set, no special attention is necessary. The drilling apparatus maintains a constant cutting speed and has a built-in counter-balancing device that does away with the need for external pressure.

Self-sharpening, the machine's sawing bit is faced with industrial diamonds seated in high-test steel. The diamond-faced bit is self-feeding and reacts automatically to pressures from the machine. The 150-lb machine saws 1 to 6-in. dia holes at the average rate of one inch per minute. Comparatively noiseless, the versatile unit operates vertically or horizontally.

More information? Circle Item 25 on postcard, page 89.

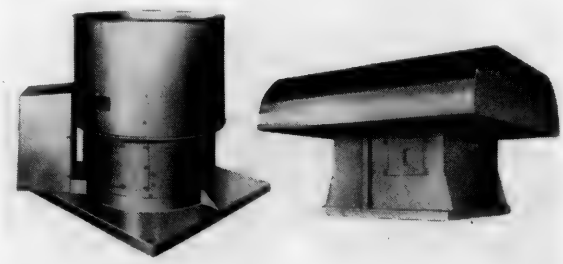
Mobile Unit Cleans Hospital Air

To help hospitals eliminate odor problems, a mobile activated charcoal air purification unit is produced by Barnebey-Cheney Co., Columbus, Ohio. Light-weight wrought-iron stands make the units more mobile so that they can be moved from room to room.

More information? Circle Item 26 on postcard, page 89.

Power Roof Ventilators

Heavy-gage, welded, propeller type roof ventilators with certified ratings is available from American Blower Corp., Detroit, Mich. The units feature a redesigned fan wheel that produces optimum efficiency when operating within the type of enclosure formed by a power roof ventilator housing.



The line includes four models. These are the upblast type exhaust ventilator, the hood type exhaust ventilator, the hood type supply ventilator, and the air intake hood. All models feature heavy-gage welded steel construction.

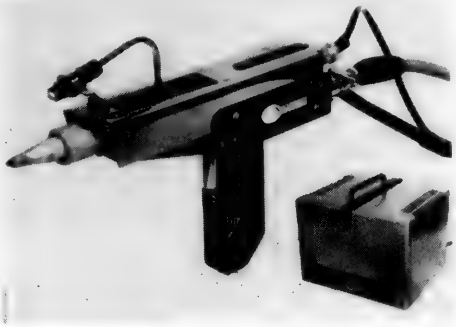
Designated Model VRV, the upblast type exhaust ventilator, on left in illustration, includes a belt driven fan and is designed especially for exhausting corrosive, oil or grease-laden fumes. Air is discharged above the roof at high velocity by this ventilator design to prevent reentry into supply ventilators.

Model SSV, hood type supply ventilator with belt driven fan, on right in illustration, is recommended for applications requiring supply air during summer months, or for applications where the climate does not require the tempering of cold outdoor air.

More information? Circle Item 27 on postcard, page 89.

Ultrasonic Soldering Iron

An improved ultrasonic soldering iron, capable of soldering aluminum without flux by completely removing the oxide film on the metal surface, has been introduced in the U. S. by Acoustica Associates, Inc., Glenwood Landing, L. I., N. Y.



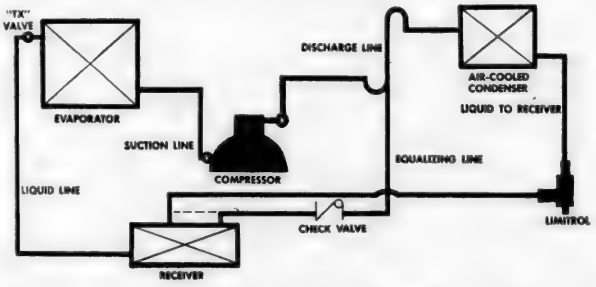
The soldering iron, with its accompanying power unit, applies ultrasonic power, high frequency sound waves, through the molten solder to the surface of the aluminum or other light metal. A cold boiling effect, called cavitation, is produced within the solder. The cavitation bubbles completely remove all oxide film from the metal surface allowing a wetting action by the solder and thus tinning takes place. No flux is required.

The soldering iron has a pistol grip, a built-in bit heating element, and can be supplied with either a chisel-shaped or tapered copper bit. Power is supplied directly from the power unit.

More information? Circle Item 28 on postcard, page 89.

Liquid Refrigerant Control Valve

A system for maintaining proper head pressures in cold weather is introduced by Halstead & Mitchell, Pittsburgh, Pa. Based on the installation of the company's Limitrol liquid refrigerant control valve, the system presents several advantages over other systems now in use. These include changeover from summer to winter, and winter to summer operation without use of hand valves, and



simpler piping because by-pass and all valve piping are done at the machine instead of on the roof. All controls are located in the machine room.

For winter operation of an air-cooled condenser it is necessary to reduce effectively the condensing surface in the air-cooled condenser to balance in capacity the output from the compressor unit. This is accomplished by the installation of the company's valve, a normally closed modulating valve, in the liquid line between the remote condenser and receiver. The valve regulates the level of liquid refrigerant in the condenser coils by sensing the condensing pressure which varies with outside temperature.

The valves are available for F-12 with a capacity up to 9 tons and a pre-setting of 110 psi, and for F-22 with a capacity of 12 tons and a pre-setting of 175 psi. At these ratings valves have only 2 psi pressure drop when wide open.

More information? Circle Item 29 on postcard, page 89.

Shim Stock Is Color Coded

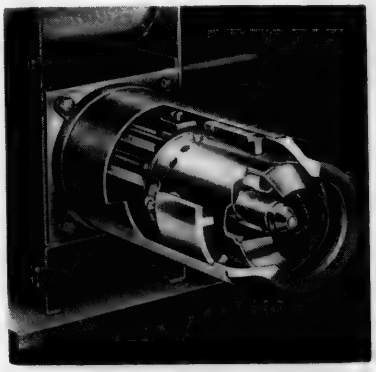
A plastic gasket and shim stock is introduced by General Gasket Co., Clifton, N. J. It is marketed under the name of Color-Plast Gasket and Shim Stock.

Each of 12 gages of the material is identified by its own distinctive color for easy selection, machined to micrometer tolerances. It is impervious to oils and greases even when they are boiling hot, and will not swell or become distorted after long use, making use of gasket cement unnecessary, the manufacturer states.

More information? Circle Item 30 on postcard, page 89.

Burns .70 to 1.5 Gph Light Oil

A shell combustion head oil burner, designated Arcoflame Model ES-2, is introduced by Plumbing and Heating Division, American Radiator & Standard Sanitary Corp., New York, N. Y.



It burns No. 1 and 2 fuel oils cleanly and completely when properly adjusted, creating no soot, smoke or fumes. Oil capacity is .70 to 1.50 gph. Conveniently located controls permit precision adjustments to be made while running.

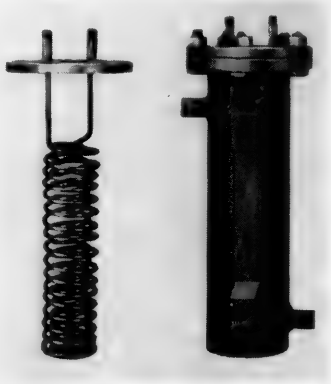
Pump, transformer, fan and motor are standardized replacement parts. Air tube lengths of 6¾, 8, 15 and 23 in. are available to meet any installation requirement.

Compact design and lightweight steel construction assure easy handling installation. Pedestal, flange, or hanger mountings adapt the burner to all applications. It has a single shaft for fuel unit, fan and motor with flexible coupling, and statically and dynamically balanced fan.

More information? Circle Item 31 on postcard, page 89.

Boiler Water Sampler

A boiler water sampler which prevents flashing when boiler water samples are taken for water treatment analysis is available from Rempe Company, Chicago, Ill. It is suitable for boiler blowdown to 900 psi and 750 deg F.



The unit has a mounting bracket which provides for easy installation in any position.

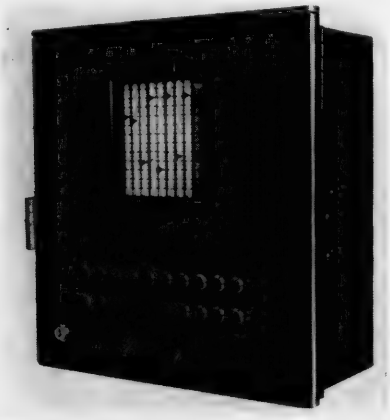
Body specifications are 4½-in. OD by 16-in. long. Cooling water connections are ½-in. IPS; sample connections are ¼-in. IPS. The cooling coil is 30 ft of copper tubing and is also available in stainless steel when required. 7-in. dia flanged head is complete with bolts, nuts, and gasket. Total weight is 40 lb.

More information? Circle Item 32 on postcard, page 89.

Multi-Point Controller

Developed by Thermo Electric Co., Inc., Saddle Brook, N. J., is a multi-point pyrometer controller that permits automatic temperature control of 4 to 10 separate units with one instrument. It combines the accuracy of a null balance potentiometer measuring circuit with speed of an electronic control system.

Applicable to almost any installation suitable for 2-position control action, including creep test machines, multi-zone ovens and furnaces; also batteries of batch



process units, and many others. The instrument saves panel board space, initial purchase and maintenance costs, and saves time by allowing setting and observing temperature controls in one location.

In operation, a pulse timer and selector-switch automatically connect thermocouples in sequence to the master control unit which compares each thermocouple voltage to its set point, and energizes or de-energizes the corresponding load relay to the process unit. Controller can be set to skip one or more points, providing optional control of a minimum of 4 and a maximum of 10 units.

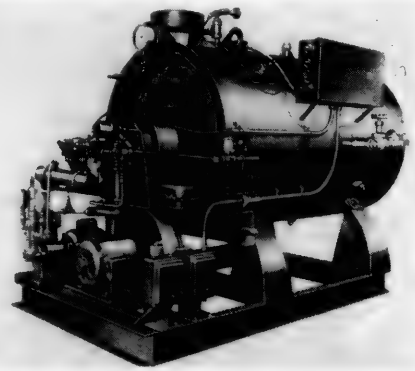
High measuring accuracy is insured by the null balance potentiometer measuring circuit which can be calibrated independently of the thermocouple and extension wire resistance. Many temperature ranges are available between −400 and +3250 deg F for all standard thermocouple calibrations, and from −100 to +1600 deg for resistance bulbs.

More information? Circle Item 33 on postcard, page 89.

50 and 60-Hp Steam Generators

Two new high pressure steam boilers, designed to conform to New York City code requirements, are introduced by Cyclotherm Div., National-U. S. Radiator Corp., Oswego, N. Y.

The units are fully automatic for unattended operation, and have capacities of 50 and 60 hp respectively with only 98 sq ft of heating surface. They can burn No. 4 oil, light oil, gas, or a combination of oil and gas.



Each unit features cyclonic combustion, which means that air is forced into the firetube at a tangent at velocities of up to 200 mph. This air immediately assumes a cyclonic shape and motion. Atomized fuel is next injected into the cylinder. Ignition is properly coordinated for safe positive operation, while the vaporized fuel follows the path of the air current to form a flaming vortex spiraling the length of the tube.

All boiler trim, as well as burner, outlets, motors, and instrumentation, are furnished and delivered already in place. There are only five simple connections for installation, and there is no need for foundations, excavations, or stack.

More information? Circle Item 34 on postcard, page 89.

Automobile Air Conditioner

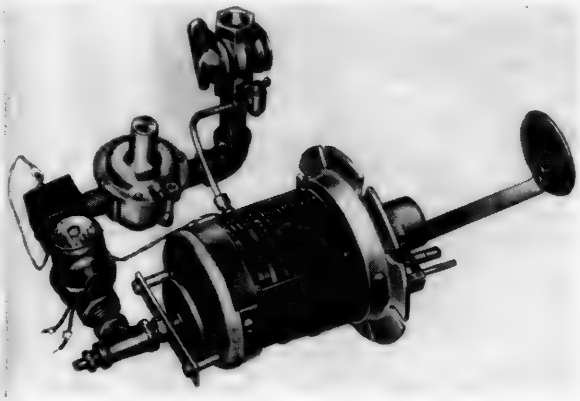
Announcement of its 1957 Model 57-UD Frigiking automobile air conditioner is made by Frigikar Corp., Dallas, Tex.

Included in the unit is pushbutton control, a temperature control to prevent freeze-ups, and all-metal panel which installs under the dashboard to blend with car's instrument panel. A magnetic clutch maintains selected temperatures, the unit delivering 390 cfm.

More information? Circle Item 35 on postcard, page 89.

Gas Burner for Conversion Jobs

A gas burner for converting oil-fired furnaces and boilers to gas operation is announced by Liberty Combustion Corp., Syracuse, N. Y.



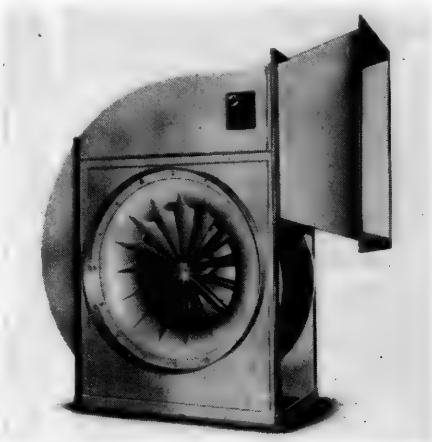
In two models, one long, one short (illustrated), it is sometimes referred to as a gun-type burner due to the fact that it was developed to replace gun-type oil burners in units designed for use with that type burner. It is fired through the same opening as the oil burner it replaces and mounts on the same mounting screws.

Short models, 19 in. long, are available in 150,000 and 200,000 Mbtu input ratings, while long models, 24½ in. long, are rated at 150,000 and 225,000 Mbtu, either with self-generating or electric control systems.

More information? Circle Item 36 on postcard, page 89.

Classes II-IV Fans

For Classes II through IV heavy-duty industrial air handling (for total pressures of 6¾ in. water gage and up), a fan which offers an exceptionally high and broad efficiency range, with a mechanical efficiency of 86%, is announced by Buffalo Forge Co., Buffalo, N. Y. Efficiency is obtained by complete inlet-to-outlet streamlining.



The inlet retains the smooth inlet bell used in this type fan for the past several years, but with further streamlining of the curved inlet guide vanes. These are cantilevered, with no center ring to cause turbulence. Air is guided into the fan wheel in a smooth spin in the direction of wheel rotation with consequent improved and stabilized fan performance. Variable vanes can be substituted with no change in fan performance since they are also cantilevered and approximate the shape and design of the fixed vanes. This provides highly desirable control, as in mechanical draft service.

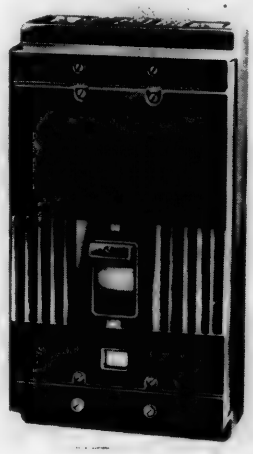
Blades are deep and gradually curved for smooth, divergent flow at all capacities and pressures from free delivery to fan shut-off. Addition of a divergent outlet provides air leaving the fan with a gradual change from velocity to static pressure

Wheel diameters range from 18¼ to 80¾ in.

More information? Circle Item 37 on postcard, page 89.

Compact Circuit Breaker

A compact new 800-amp molded case circuit breaker which is 6½-in. shorter than conventional breakers of the same rating is announced by the Circuit Protective Devices Department, General Electric Co., Plainville, Conn.



The new breaker design, designated the KM-frame, covers applications now using M-, L-, and KL-frame sizes. It permits space savings in the ultimate size of the equipment in which it is incorporated, and at the same time simplifies stocking by making possible standardization on a single equipment design.

One frame size can now be used for all ratings from 125 through 800 amp. Space savings up to 30% for each breaker are possible in rating above 400 amp.

The circuit breakers are available in 2- and 3-pole designs. The 2-pole units are rated 125 to 800 amp, 600-volt a-c; and 125 to 600 amp, 250-volt d-c. The 3-pole units are 125 to 800 amp, 600-volt a-c.

More information? Circle Item 38 on postcard, page 89.

Scotch Marine Boiler Line

Four new additions to the present Scotch-marine boiler line are announced by Federal Boiler Co., Midland Park, N. J. The new sizes, Models FM-15180, FM-18220, FM-21250, and FM-24290, increase the certified output rating from a previous top rating of 131 hp to 261 hp.

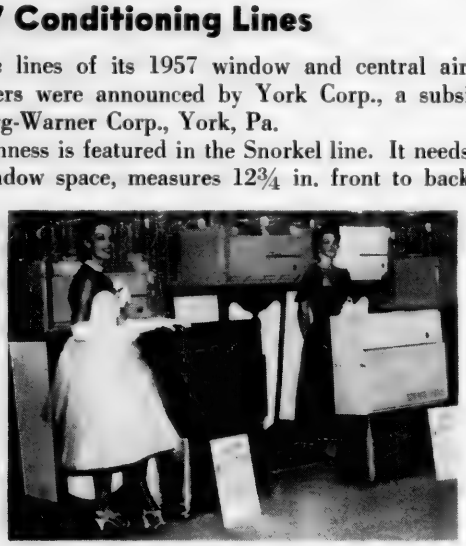
The four larger models incorporate a wet back principle which extends boiler water all the way to the rear and at the back of the boiler. This design is said by the company to allow a greater amount of boiler water to be heated at the same burner firing rate.

More information? Circle Item 39 on postcard, page 89.

1957 Conditioning Lines

Five lines of its 1957 window and central air conditioners were announced by York Corp., a subsidiary of Borg-Warner Corp., York, Pa.

Thinness is featured in the Snorkel line. It needs 9 in. of window space, measures 12¾ in. front to back, and



is 31 in. wide. A red light goes on when filters of the Clean Air Sentry line need changing. The units also will reverse for heat-pump duty.

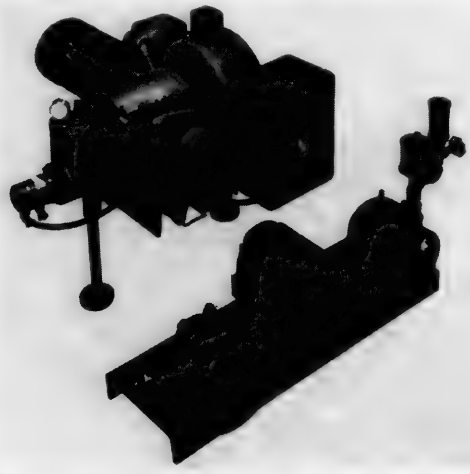
The Pathfinder is a central air conditioner in 1¾, 2, and 3-hp models. Champion central air conditioners are remote type; come in 8 models ranging from 2 to 7½ hp.

Hi-Ef Twinline units are also remote condenser-compressor units, but contain two compressors and two complete cooling circuits. Each circuit, including copper tubing, is hermetically sealed at the factory.

More information? Circle Item 40 on postcard, page 89.

Burns No. 5 Fuel Oil

Savings up to 30% are claimed for its 5-20 gph, 60 hp Econol TH-60, and 7-28 gph, 84 hp TH-84 oil burners by Industrial Div., York-Shipley, Inc., York, Pa. A 2,000 watt preheater heats No. 5 oil to the burning temperature.



Iris shutter gives accurate, metered air control; built-in viscosity compensator assures constant firing regardless of oil viscosity. Having a low-fire start, ignition without flarebacks is assured. Compressor, fuel pump, and motor are located on separate chasis, as illustrated, which may be installed on a wall or ceiling mounted.

Net standing steam radiations for maximum boiler rating are 6170 and 8650, respectively, net water radiations are 9880 and 13,850, for the models which are each equipped with 90 gph pump.

More information? Circle Item 41 on postcard, page 89.

Tester Checks Thermocouples

A millivoltmeter for checking the voltage output of safety thermocouples on gas-fired equipment is announced by Simpson Electric Co., Chicago, Ill.

Designated Model 387, the pocket-size tester is simple to use. The lead clips are placed across the thermocouple terminals to test for correct voltage. Faster servicing of gas-fired hot water heaters, clothes dryers, furnaces, space heaters, and gas refrigerators is promised.

Ranges are 10, 30, 100, 300, and 1000 mv. Large binding posts, clearly labeled by an engraved-filled panel, are used for range selection. Accuracy is 3% of full scale at ambient temperatures of 50 to 120 deg F. From −55 to +185 deg, an additional error of no more than 2% can be expected. It has a low current draw of 750 microamperes, which is calibrated to within ±2% of full scale. This permits accurate computing of instrument loading when necessary.

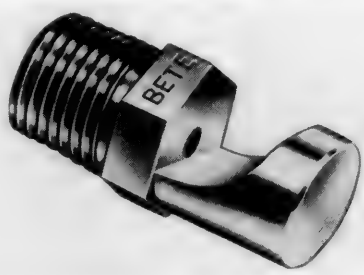
The device is 3 x 5⅞ x 2½ in., and has a molded, black Bakelite case. Price is under thirty dollars, which includes a pair of 48-in. leads, and instructions.

More information? Circle Item 42 on postcard, page 89.

Flooding Nozzles

A new line of flooding nozzles is announced by Bete Fog Nozzle, Inc., Greenfield, Mass.

The wide angle flat spray pattern, 145 deg at 40 psi, results in extremely low spray impact. These low cost nozzles are designed for use for spraying flooded eliminator plates in air washers, for special fire protection prob-



lems, and for industrial applications where a wide angle fan spray is required.

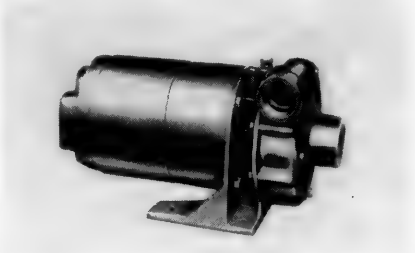
Series FF nozzles are available in nine models with ⅛ through ¾-in. male pipe thread connections. The orifice sizes vary from 3/32 to ½-in. dia with flow rates from ½ to 75 gpm.

Although the standard material is brass, the nozzles are readily available in various types of stainless steel, aluminum, nylon, teflon, hard rubber and other machineable plastics and alloys.

More information? Circle Item 43 on postcard, page 89.

Close-Coupled Centrifugal Pumps

Efficient units for air conditioning, booster, condensate and other services are close-coupled centrifugal pumps, Fig. 3642 and 3643, developed by Goulds Pumps, Seneca Falls, N. Y. Simplicity, ruggedness, and trouble-free service are characteristic of these single-stage, enclosed impeller type pumps.



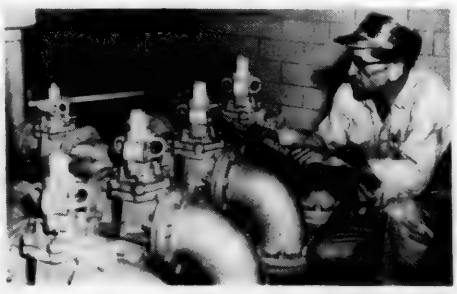
Since the motor and pump are a single complete unit, installation is quick and inexpensive. By simply bolting the unit down and connecting the piping and power, the pump is ready to use. Also, the compactness of the unit allows it to fit easily in any layout when space is at a premium. Close-coupled construction assures permanent alignment of rotating parts and gives a safe, substantially built pump unit. No coupling is required.

Fig. 3642 is available in 1 and 1¼-in. sizes with motors from ¼ to 2 hp and capacities up to 100 gpm. Fig. 3643 is available in 1½ and 2½-in. sizes with 3 to 7½-hp motors for capacities up to 350 gpm.

More information? Circle Item 44 on postcard, page 89.

Valve for Raw Sewage

A plug type valve able to withstand the punishment of sewage influent is manufactured by DeZurik Shower Co., Sartell, Minn. Much of its efficacy is credited to its plug



facing made by Hycar American rubber, a raw material supplied by B. F. Goodrich Chemical Co.

Valve was designed to solve the problem of valving raw sewage through disposal plant lines where strings, sand, metal chips, and other solids in sewage ordinarily destroy a valve's efficiency quickly by scoring the seating surfaces, while organic and inorganic chemical wastes which attack surfaces exposed to the flow.

The eccentric action of this valve swings the plug back and away from the seat to open wide with minimum effort and with no friction from the plug itself. Closing the valve wedges the eccentrically-shaped plug against the eccentrically-raised seat, sealing tightly despite intervening solids.

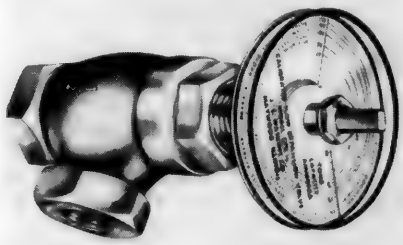
Bonded to the metal plug-core, rubber facing has the rigidity to close tightly, yet retains the surface resiliency to seal around solids which may lodge on the valve seat and resist abrasion from solids in the flow, eliminating scoring on the plug face. The rubber has high resistance to chemical attack.

It is claimed that after several years of continual operation, there have been no reported failures of the rubber-faced plug.

More information? Circle Item 45 on postcard, page 89.

Calibrated Expansion Valve

Calibrated discs are provided on the new Cali-Flo hand expansion valve manufactured by J. E. Watkins Co., Maywood, Ill. These permit setting the valve opening for



the rated tonnage of a cooling or freezing coil, as controlled by the pressure drop through the valve.

For example, the Model CFV, ½-in. valve illustrated can be set for ammonia evaporators rated from 1 to 18 tons at the existing pressure drop.

Additional information is available from the company.

More information? Circle Item 46 on postcard, page 89.

Taper Face Flange

The 125 lb taper face light weight welding neck flange, which offers important technical and cost advantages where the lighter schedule of pipe must be connected to 125 lb cast iron valves and other equipment, is manufactured by Tube Turns, a division of National Cylinder Gas Co., Louisville, Ky.

The flange, on which a patent is pending, overcomes two difficulties. First, its tapered face causes greater pressure to be exerted near the bore. This eliminates the usual problems met in obtaining a leakproof seal when a conventional flange with a full face gasket is used. Second, strain gage tests have shown that the new flange, equipped with a full face gasket, can be safely bolted to cast iron or semi-steel flanges. That is, it will not overstress or crack them, nor the integrally cast valves, pumps and other facilities they may serve. Also, hydrostatic tests indicate that when the new flange is properly employed the joint is capable of withstanding approximately three times the pressure it could contain if the taper was omitted.

More information? Circle Item 47 on postcard, page 89.

Gravity Roof Ventilators

A new line of weatherproof gravity roof ventilators is announced by Leslie Welding Co., Inc., Chicago, Ill. The ventilators are made of galvanized steel, and are designed for maintenance-free operation under all weather conditions.

The rotary turbine type is available in two models:

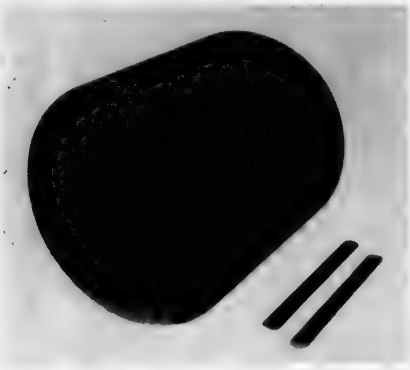
residential or light construction and the larger industrial model. Both models are designed for permanently noiseless performance and feature weatherproof rotor bearings. Fin design is such that minimum wind velocity is required to turn the unit.

The stationary type, which is designed to draw air by utilizing pressure differentials between inside and outside atmospheres, is an extremely versatile unit, while the revolving head type has a weathervane fin which is sensitive to the slightest wind shift and keeps the exhaust opening downwind.

More information? Circle Item 48 on postcard, page 89.

Entrainment Separator

A corrosion-resistant entrainment separator for the removal of liquid particles from air and other gases has been developed by National Carbon Co., a Division of



Union Carbide and Carbon Corp., New York, N. Y. An impingement type entrainment separator made of Karbate impervious graphite, the type MV scrubber is a compact, self-contained unit ready for inserting in a pipe line.

Rods of impervious graphite, streamlined in cross-section, are staggered in rows within the cylinder. Although minimum clearance is one-fourth of an inch, which prevents clogging, a beam of light will not pass through. As the gas to be scrubbed flows through the cylinder, moisture particles impinge on the separator rods and the gas flows on through.

The unit can be operated at temperatures ranging from 340 deg F to minus 40 deg, and at pressures from full vacuum to 65 psig.

It is available from stock in four internal cylinder diameters, 6, 8, 12 and 16 in. Each cylinder is 22-in. long, and is designed for installation between the faces of 150-pound ASA flanges with no enlargement of the pipe line. The internal separator rods are keyed in place without cement, thus permitting complete disassembly in minutes for cleaning. Further information, including separation efficiencies, is available from the manufacturer.

More information? Circle Item 49 on postcard, page 89.

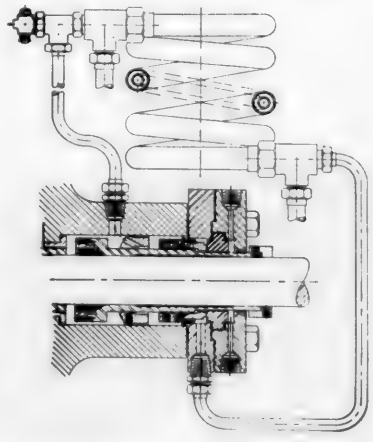
Plastic Pipe and Tubing

Entry into the plastic pipe industry with a full line of both rigid (PVC) and flexible (Polyethylene) pipe and tubing is announced by Marken Plastics Corp., Los Angeles, Calif. A complete range of sizes from ⅜ to 4 in. with all types of fittings will be offered.

More information? Circle Item 50 on postcard, page 89.

Mechanical Seal

Once installed, no further attention need be given this boiler feed pump mechanical seal, according to its manufacturer, Crane Packing Co., Morton Grove, Ill.



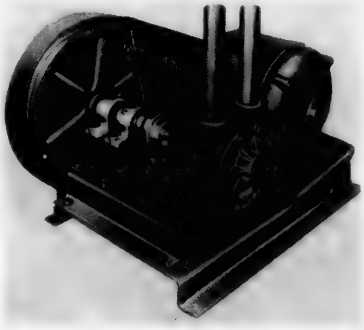
Long seal life is obtained through the use of a special closed circulating system. This engineering system provides cool water in sealing chamber assuring best seal performance.

Seal comes fully engineered for the particular operation, including adaptation to pump design and piping arrangement. Plans are furnished. All necessary recommendations are supplied and heat exchanger size is specified, providing a package that can be installed without major stuffing box alteration.

More information? Circle Item 51 on postcard, page 89.

Pump Unit for Heavy Oils

Type SU pump units, designed principally for handling heavy fuel oils in industrial and commercial oil burner service are announced by Tuthill Pump Co., Chicago, Ill. They may also be used for the movement of any non-corrosive, highly viscous liquid with lubricating qualities.



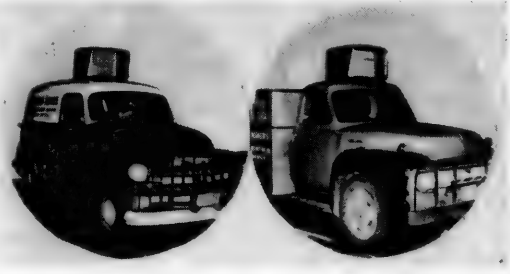
Of lighter weight construction without sacrifice of durability, units are provided for either 2 or 4 V-belt drives, for pressures up to 300 psi, and in capacities up to 2030 gph. Sub-assemblies of the pumping unit, without drive, are also furnished for incorporation into larger assemblies by original equipment manufacturers.

More information? Circle Item 52 on postcard, page 89.

Comfort Cooler for Truck Cabs

Self-contained and self-powered mechanical air-conditioners for truck cabs, trade-named Kab Koolers, are manufactured in their entirety by D. W. Onan & Sons Inc., Minneapolis, Minn.

Single-unit design makes installation simple. Weighing only 225 lb, it mounts directly on and to the roof of the truck cab. Completely self-contained except for fuel pump, fuel supply, and starting batteries, it is a gasoline or propane engine-driven, air-conditioning package. It has a rated capacity of 1⅓ tons at 110 deg F, 40% r.h., ample to completely air-condition the largest truck cabs on the hottest days.



Heart of the system is the direct-mounted engine-compressor. Its rugged power source is the compact Model AJ engine, a gasoline or propane burning, 4-cycle, single-cylinder, air-cooled unit rated 4.25 hp at 2600 rpm. Fuel supply for the engine normally is taken from the fuel tanks of the main propulsion engine when its fuel is gasoline. An alternate fuel tank can be supplied.

Designed specifically for comfort cooling, dehumidifying, and circulating air in the driver's compartment of a truck chassis, many other cooling applications are suggested. Cooling capacity of the unit makes it highly effective in reducing temperatures on hot days to an efficient working level for operators of cranes, power shovels, earth movers, and other equipment where the operator's compartment is enclosed. It will provide comfortable cooling for the interiors of display vans, bookmobiles and mobile show rooms.

More information? Circle Item 53 on postcard, page 89.

Air to D-C to Air Controls

Mechanical and pneumatic signals can be converted to d-c current for long range transmission and then reconverted to pneumatic pressure for actuating control valves or other pneumatic equipment with a system developed by Fielden Instrument Div., Robertshaw-Fulton Controls Co., Philadelphia, Pa. Remote measurement, indication, recording and controlling of process variables eliminates electronics and complex circuitry.

Transmitter unit uses a flexure-mounted beam and pneumatic nozzle as an error detector and power amplifier to convert a pneumatic signal to an electric signal and converts pneumatic signals of 3-15 psi or equivalent mechanical outputs into 3-15 milliamperes d-c current for electrical transmission. A receiver then converts this d-c signal to pneumatic pressure of 3-15 psi.

More information? Circle Item 54 on postcard, page 89.

Pipe Protective Tape

A new Safe-T-Clad tape, extruded of Tenite polyethylene and manufactured by F. O. S. Industrial Tape Div., The Seamless Rubber Co., New Haven, Conn., is an advanced modern medium for impeding pipe corrosion. Wrapped on pipe for a great variety of industrial uses, it is said to insure protection for years. The polyethylene material permits little or no moisture absorption or penetration. And, according to the manufacturer, the tape resists electrolytic attack and microbiological deterioration, and does not leach out when buried in the earth.

Another advantage of the tape is its ease of application by either manual or mechanical means. No special conditioning, as with heat, is required. A non-corrosive adhesive compound that is bonded to one side of the polyethylene makes it ready to use. Wrapped spirally on pipe, with proper tension, it gives a tight, firm coating.

The tape is available in 100-ft rolls in widths of 1, 2, 4, or 6 in.

More information? Circle Item 55 on postcard, page 89.

Blueprint Machine Is Portable

Reproductions of any type of drawing or written matter up to 2½ x 14 in. are possible on a 5½ lb portable blueprint machine manufactured by Product Engineering Laboratories, Newark, N. J.

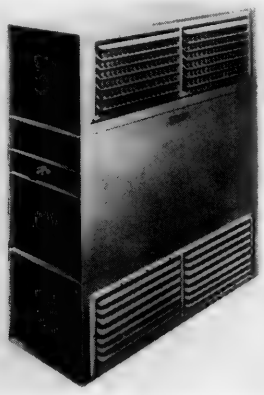
Measuring 18 in. long by 9½ in. wide by 4 in. deep, the Pelprinter 60 comes in a luggage-type, unbreakable plastic carrying case, plugs into 110-volt outlets, and can be adapted to work on automobile current.

Operating on dry vapor process, the entire reproduction takes less than 1½ min., the manufacturer states, at a cost of approximately one cent per copy sheet. Complete unit sells for about sixty dollars.

More information? Circle Item 56 on postcard, page 89.

Sectionalized Heating Unit

A large capacity heating and ventilating unit of sectionalized design is announced by The Trane Co., La Crosse, Wis.



Nine unit combinations are offered, ranging from a basic model supplying untempered make-up air to a deluxe model that provides heating, ventilation and humidification. The deluxe model (illustrated) includes an insulated and baffled discharge plenum with insulated enclosure for motor mounting, fan section and coil with attached face and bypass section, and a combination filter-mixing box.

Designed for use in large buildings, such as auditoriums, theaters, garages and industrial plants, the unit has wide coil selection to provide a range of final temperatures that make both comfort and process applications feasible. Typical process work includes curing-drying, fog removal, exhaust of contaminated air, and moisture control.

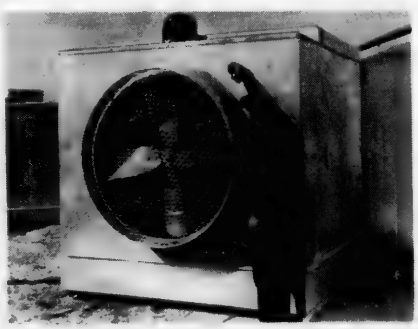
A louver fin discharge grille adjusts for various air discharge patterns. Capacities range from 1150 to 36,000 cfm, 50,000 to 1,900,000 Btu, giving a flexibility of application suited to a variety of heating and ventilating needs.

Coils in the unit can be 1 to 3 rows as desired. There are 3 fin spacings in a choice of 3 coil types. Filters are throwaway or permanent type, either of which are available for low, intermediate, or high air velocities.

More information? Circle Item 57 on postcard, page 89.

Towers Clean Easily

A cooling tower with a new side-suspended decking feature for easy basin cleaning, is the Series CF packaged unit built by Dover Mfg. Co., Independence, Mo. It is suited for air conditioning and refrigeration installations,



and for engine jacket and compressor cooling; its new suspension system leaves the bottom of the basin completely uncluttered for quick periodic cleaning.

A horizontal induced draft tower with propeller fan and stainless steel fan shaft, the unit is available in sizes ranging from 2 to 100 ton capacity. All towers are hot-dip galvanized after fabrication.

More information? Circle Item 58 on postcard, page 89.

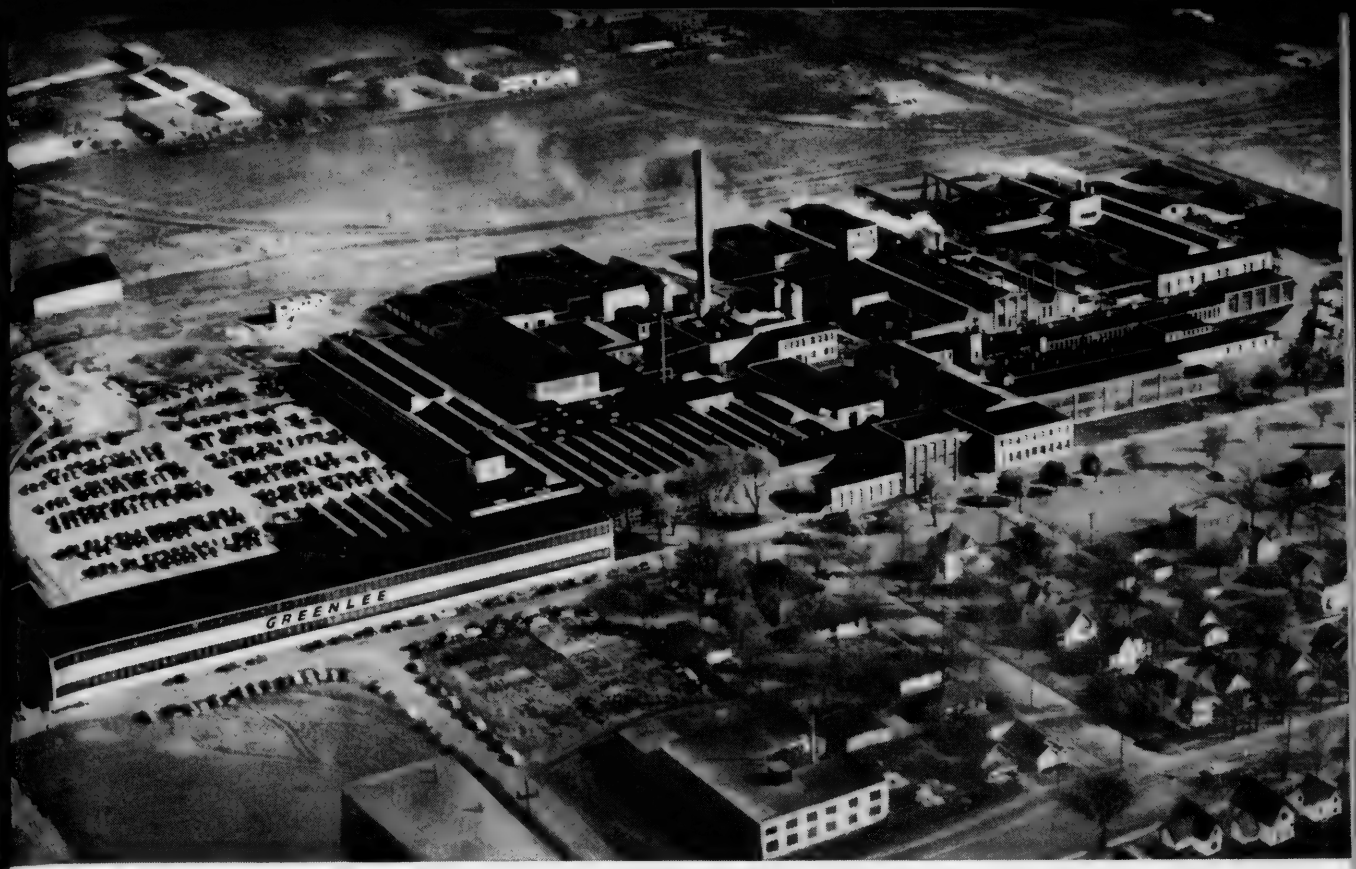
Gas Burners Are Explosion-Free

An explosion-free control circuit for their Synchro Flame gas burners, which virtually eliminates the possibility of explosion even under conditions of bad misadjustment, is announced by Synchronous Flame, Inc., Walworth, Wis. It is designed particularly for medium-size boilers, from 10 to 150 hp, where explosions are a problem in gas firing.

A combination of electronic sensing devices and relays automatically lock out the starting circuit of the burner whenever explosion-producing conditions may develop. An extra purging cycle is then activated to clear the undesirable conditions. Manual reset of control circuit is mandatory before restarting.

More information? Circle Item 59 on postcard, page 89.

(Continued on page 120)



GREENLEE BROS. & CO. CUT FUEL COSTS 17%

B&W boilers with Jet Ignition Stokers assure savings despite increased fuel prices

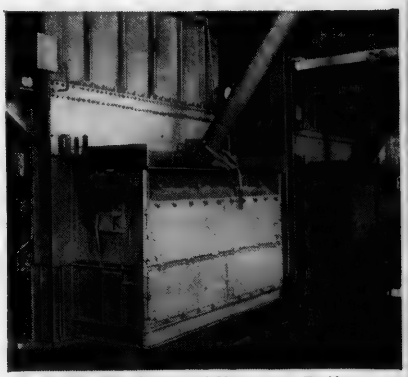
As one of the country's leading machine tool manufacturers, Greenlee Bros. & Co., Rockford, Illinois uses large amounts of steam for all year operation of air compressors and for plant heating. And to maintain profitable overall operation it is important that the steam supply be dependable—and steam generating costs kept to the minimum.

Since the installation of two B&W Integral-Furnace Boilers, Greenlee has enjoyed uninterrupted steam service from a dependable, efficient source. Equipped with modern B&W Jet Ignition Stokers, these units have built a record of operating efficiency while burning a wide variety of Illinois bituminous coal.

At Greenlee, as at other industrial plants using steam, careful consideration of long term costs and proven reliability were important factors in the choice of B&W Integral-Furnace Boiler units.

If your steam production cost is important . . . if you are considering steam plant modernization or expansion for increased dependability and efficiency . . . it will pay you to investigate B&W's more than 90 years of boiler experience. Let us show you what it can do for you.

For further information or assistance write to The Babcock & Wilcox Company, Boiler Division, Dept. AHV-1, 161 East 42nd St., New York 17, N. Y.



Two B&W Integral-Furnace Boilers at Greenlee, equipped with B&W Jet Ignition Stokers, burn a wide variety of Illinois bituminous coal.

HERE'S WHY YOUR STEAM COSTS LESS With B&W Integral-Furnace Units

- Minimum floor space and headroom requirements
- High fuel economy
- Smokeless combustion
- Adaptable to all fuels and firing methods
- Economical fast steaming
- Water-cooled furnace
- Clean, dry steam at all ratings, even with high boiled water concentration
- Quick response to wide and heavy load swing demands
- Easy to inspect and clean
- High availability with least attention

BABCOCK & WILCOX

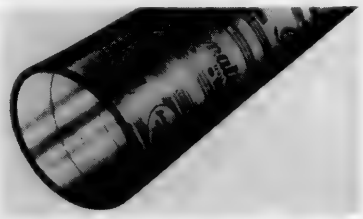
BOILER DIVISION

G-827-1B

(Continued from page 118)

Fiber Duct for Slab Floors

For installation in concrete slab floors, a fiber duct consisting of tightly-wound layers of fiber, laminated with waterproof glue is announced by Fibre Duct Div., International Oil Burner Co., St. Louis, Mo.



Savings will result from the fact that the duct costs only about 50% as much as conventional materials. Available in 4, 5, 6, 7, and 8-in. sizes, in 12, 14, 16, 18, and 20-ft lengths, it fits all standard connections.

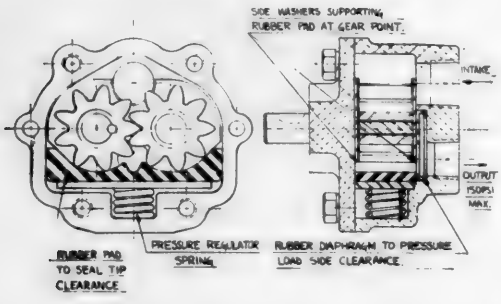
Duct interior lining is aluminum foil and the outer layer of the fiber is impregnated with asphalt. The ends of each tube are paraffin dipped. Although it weighs little duct will support more than 200 lb per lineal foot, the manufacturer states.

More information? Circle Item 60 on postcard, page 89.

Gear Pump of New Design

Development of a gear pump of simple design that lends itself to low cost manufacturing techniques is announced by New Products Corp., Skokie, Ill. For fluid pressures up to 200 psi, it is recommended for such applications as engine oil pumps; primary pump for fuel injection systems; pumps for automatic transmissions, oil burners, and low pressure machine tool mechanism.

Typical arrangement for a basic version of the pump, as illustrated, shows the two conventional gears mounted on shafts in a simple housing which can be designed to suit the specific application. Mating gears can be mass


SIDE WASHERS SUPPORTING RUBBER PAD AT GEAR POINT
INTAKE
OUTPUT 150PSI MAX.
RUBBER PAD TO SEAL TIP CLEARANCE
PRESSURE REGULATOR SPRING
RUBBER DIAPHRAGM TO PRESSURE LOAD SIDE CLEARANCE

produced without close tolerances or fine tooth finish. They can be hobbed or rolled or made of metal powder and used without fussy finishing operations. Similarly, the housing cavity can be used practically as die-cast without machining or profiling around the periphery as peripheral clearance plays no part in pump performance.

Three basic elements constitute the heart of the invention. The molded synthetic rubber element conforms with zero clearance to the gear teeth along the pressure outlet side of the pump. This is the only area that requires close clearance. It is perfectly feasible to achieve zero clearance without resorting to fine mechanical tolerances.

To provide for complete safety of operation, a calibrated spring is installed, as shown, to control the action of the tip clearance pad. In effect, it serves as a pressure relief valve, so calibrated as to cut off at an established maximum pressure value, thereby permitting the tip clearance pad to retract from its contact with the gears.

Finally, the molded synthetic rubber diaphragm is installed under the two gears, permitting a reasonable degree of back-lash in the mounting of gears within the housing, again contributing to low cost machining practice. In operation, the diaphragm is automatically inflated by pressure fluid, thereby taking up all clearance between the upper and lower faces of the gears.

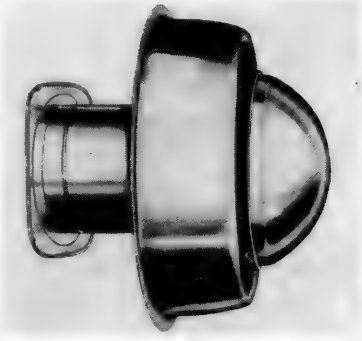
Performance characteristics are quite unusual. Recent results with the small pump illustrated here, the gears being 1.5 in. dia. This test schedule employed SAE 20 oil. With fluid held at 180 deg F, the pump delivered a flow of 12 gpm at 60 psi with pump speed of 2200 rpm. When the temperature level was raised to 250 deg, flow increased about 0.3 gpm under the same conditions.

More information? Circle Item 61 on postcard, page 89.

Kitchen Ventilators

Redesigning of its Kitchen-Aire ventilating fans resulting in an extra 30% efficiency is announced by Stewart Industries, Inc., Indianapolis, Ind. A third larger motor drives an impeller with double the former number of vanes.

The new line consists of the single vent, KA 155, rated at 550 cfm, and the multiple-vent, KA 170, rated at 1100

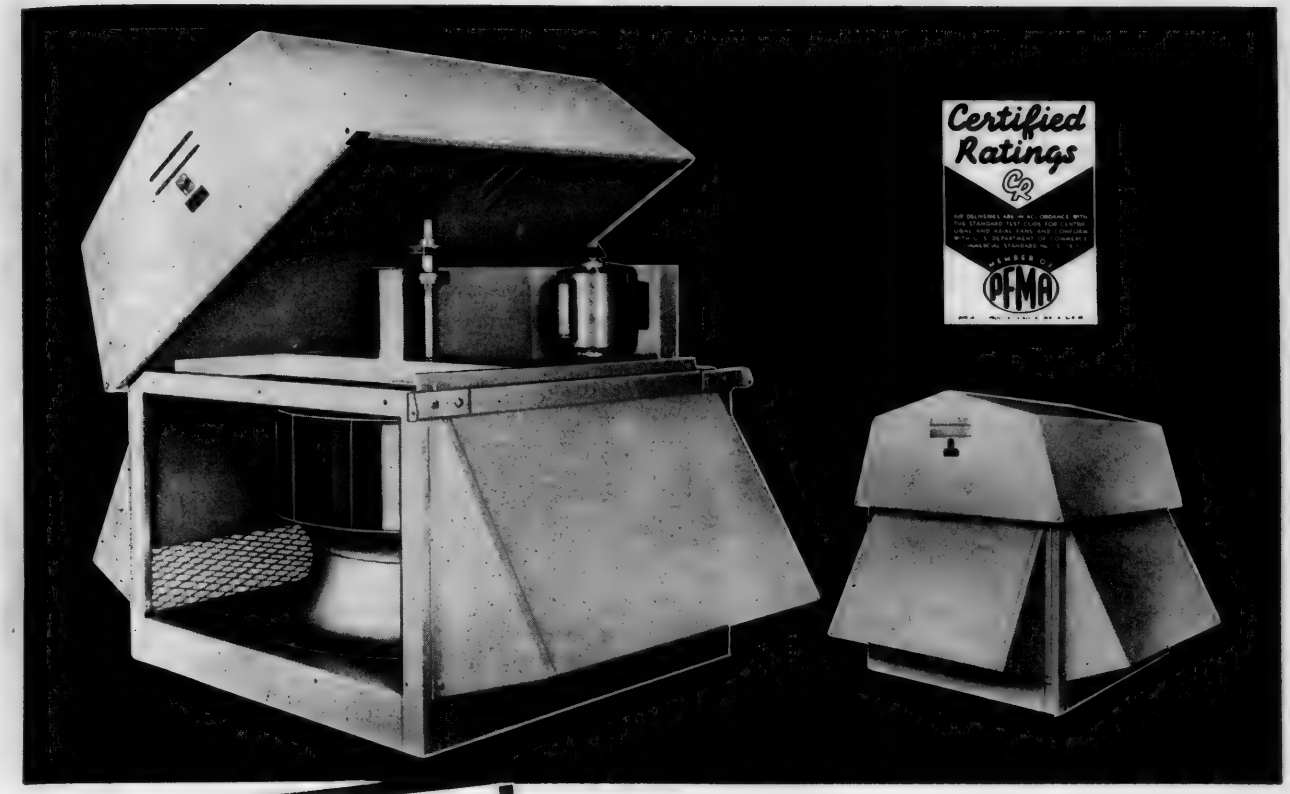


cfm. To help solve dealer stocking problems, the roof model was dropped from the line, but conversion kit was added so that both models may now be installed on the roof. Both models are equipped with a spring loaded back draft damper which will stay shut in anything but a hurricane.

Fans will not fan a fire because they are all now equipped with a thermal overload switch which will automatically cut the current should a blaze accidentally start on the stove or in the ducts.

More information? Circle Item 62 on postcard, page 89.

(Continued on page 122)



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NEW Peerless-Electric®

Centrifugal Roof Ventilator...

DEVELOPED AND MANUFACTURED WITH APPLIED CENTRIFUGAL BLOWER PRINCIPLES

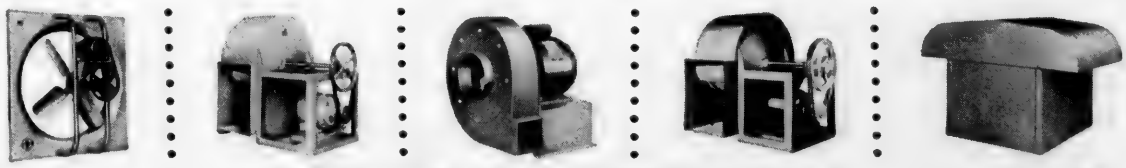
QUIET! . . . Matching wheel cone accurately fits venturi inlet to create quieter, smoother air movement. Excellent for churches, auditoriums, hospitals, and schools.

ADAPTABILITY! . . . Fits standard curb sizes. Lower horsepower ratings for quieter operation. Higher horsepower for commercial and industrial applications.

PERFORMANCE! . . . Each unit air-tested, and rated to assure certified ratings. Construction gives exceedingly high efficiencies. Detailed performance data completely covered in Bulletin SDA-220.

STURDY! . . . All welded construction. All material is 16 ga. or over. Built for the life of the building.

A COMPLETE LINE OF AIR MOVING EQUIPMENT



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FAN AND BLOWER DIVISION

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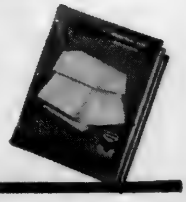
Write today for Bulletin SDA-220 on Peerless Centrifugal Roof Ventilators

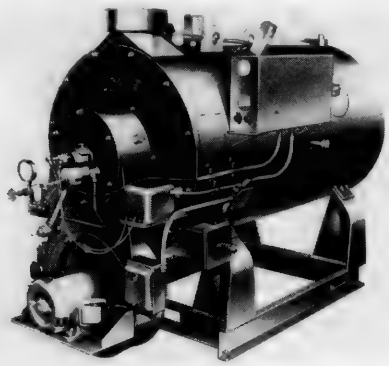


(Continued from page 120)

Hot Water Generators

Compact package generators designed specifically for forced circulation hot water systems are announced by Cyclotherm Div., National-U. S. Radiator Corp., Oswego, N. Y.

Outputs range from 670,000 to 6,700,000 Btu, and from 4,467 to 44,667 gross EDR. They are made to handle varying requirements of large or small hot water heating systems, singly or in a battery, and take recirculated water from return lines with wide temperature differentials.



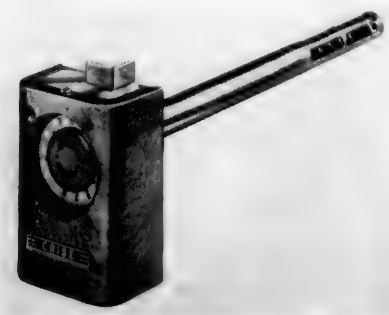
Minimum fuel efficiency of 80% is accomplished by use of the entire heating surface of the firetube, the flame forming in a cyclonic shape and motion along the complete length of the furnace. The first pass through the firetube delivers 65 to 70% of the fuel value, while the single pass of return tubes uses the heat of the residual gases for an additional 15 to 20% efficiency. Each model is adaptable to burning oil, gas, or a combination of oil or gas.

More information? Circle Item 63 on postcard, page 89.

Fan and Limit Control

A new combination fan and limit control is introduced by Acro Manufacturing Co., Columbus, Ohio.

Combining all the features formerly found only in bulkier, higher priced controls, this design offers separate fan and limit circuits, ¾-hp fan switch rating, gold plated contacts for limit circuit, and precision switches. Fan and limit control settings and fan differential are all adjustable, and the limit differential is fixed at about 20 deg F. Of particular note is the arrangement of the terminals to provide extra space for faster, easier wiring.



In this compact unit, the limit side may be used for line, low voltage or millivolt circuits. Models are available with or without summer fan switch and with or without watchspring type bimetal. Additional details may be obtained.

More information? Circle Item 64 on postcard, page 89.

Auto Air Conditioner

An auto air conditioner, the Vornado, is introduced by The O. A. Sutton Corp., Inc., Wichita, Kan. Mass production of these units materially lowered its cost, it is claimed.

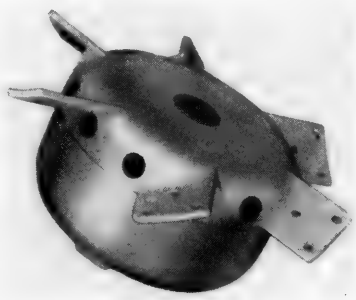
Five air circulators are incorporated into the unit that fits under the dash. Each circulator is adjustable, which company says results in 20% greater cooling effect.

A Tecumseh compressor uses Freon 12. Fan motor is 3-speed, series wound 1/20 hp. Air capacity is 250 CFM. Units are available in 6- or 12-v models. High speed on the blower is 2600 rpm; medium speed, 2400 rpm; and low speed, 2100 rpm.

More information? Circle Item 65 on postcard, page 89.

Remote Condenser Fan Motors

Three reduced-depth direct drive fan motors designed for application in remote condenser, central air conditioning systems are in production by Electric Motors and Specialties, Inc., Garrett, Ind.

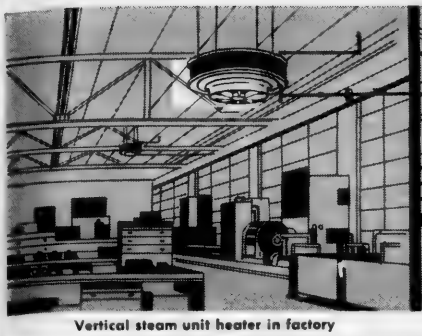


A key advantage, according to the maker, is reduced-speed operation providing quieter, vibration-free performance. The S-60-D is rated 950 rpm, 1/12 hp, for 1¾ to 2-ton units; S-13-H, 775 rpm, ⅛ hp, used on 2 to 3-ton units; and S-16-H, 625 rpm, ⅓ hp, for 5-ton units. Reduced axial lengths are approximately 4, 4½, and 5 in. respectively.

Designed for vertical or horizontal operation, motors are offered complete with aluminum, pressure type blades and mounting components, single-point mounting components, and a thermal protective device. Each is equipped with the company's central lubrication system, a nylon thrust bearing, and a single-point oiling port.

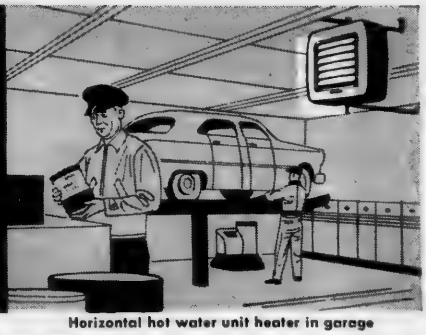
More information? Circle Item 66 on postcard, page 89.

(Continued on page 124)

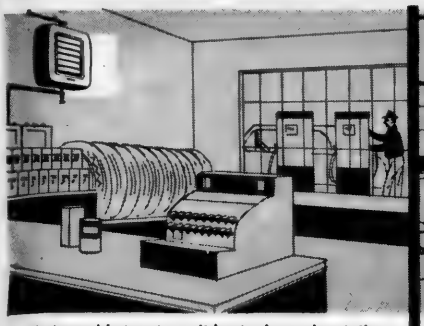


Vertical steam unit heater in factory

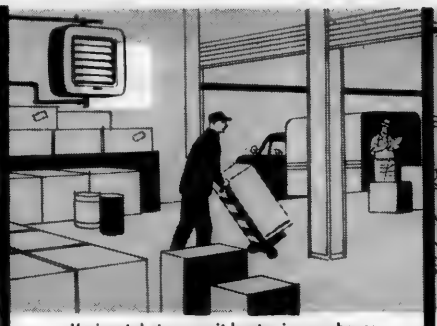
Horizontal gas unit heater in store



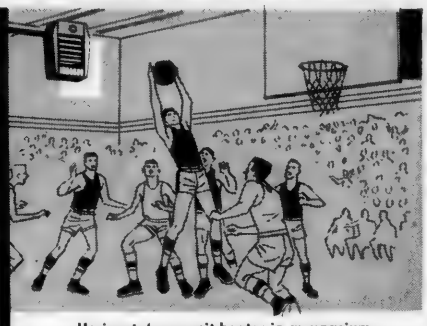
Horizontal hot water unit heater in garage



Horizontal hot water unit heater in service station



Horizontal steam unit heater in warehouse



Horizontal gas unit heater in gymnasium

why so many users of unit heaters say

make mine Modine

Satisfied users continue to insist on Modines. They like the high level of comfort Modines squeeze out of every fuel dollar. And they approve of the attractive appearance, the safety, the silent operation . . . the little care Modines require.

FOR STEAM AND HOT WATER

Modine horizontal delivery models are built in blow-through and draw-through types, in 36 different capacities. Direct-from-pipe suspension hook-up many times saves up to $20 on each Modine unit.

Modine vertical delivery models are offered in 26 different capacities, each with a choice of 4 types of air deflectors.

Write for free Bulletin 155.

GAS-FIRED

Modine horizontal delivery gas-fired models are offered in 8 AGA-approved sizes — 25,000 to 310,000 Btu. Choice of stainless or aluminized steel heat exchanger with stainless steel burner. Units are up to 50% lighter than other makes for lower shipping and installation costs. Modine port design provides four times the free area of conventional drilled ports.

Write for free Bulletin 656.

NOTE: Modine offers a specially built line of premium HCR models for use where internal corrosion is a problem.

For further facts, see the Modine representative listed in the classified section of the phone book, or write Modine Manufacturing Co., 1511 DeKoven Ave., Racine, Wisconsin.

Steam and hot water unit heaters

Gas-fired unit heaters

Modine UNIT HEATERS

In Canada: Sarco, Ltd., Toronto

U-1324

(Continued from page 122)

1957 Series Air Conditioners

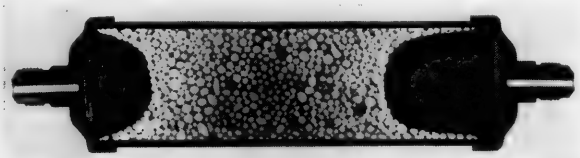
Announcement of its 1957 line of packaged commercial air conditioners in 3, 5, 7½, 10, 15, and 20-ton sizes was made by American Blower Corp., Detroit, Mich. (Illustrated, left to right, are the 20, 10, and 5-ton units.)

Heavy-gage furniture steel cabinets designed to be attractive in restaurants, schools, churches, etc., and inclusion of a sloped evaporator coil with spiral aluminum fins and staggered copper tubes for greater contact efficiency, are the major innovations this year. Safety devices include overload cut-outs in compressor and fan motor circuits, and a fusible plug which melts to release refrigerant in the event of overheating.

More information? Circle Item 67 on postcard, page 89.

Driers Have Two Filters

Its line of Permasorb-100 filter-driers, incorporating a desiccant called Molecular Sieves and featuring two low-micron filters, is announced by the McIntire Co., Livingston, N. J. Desiccant is a product of Linde Air Products Co. Div., Union Carbide and Carbon Corp., New York, N. Y.



Filters at inlet and outlet end remove foreign matter often encountered in refrigeration systems. Desiccant capacity is measured on a weight-per cent scale (lb water adsorbed per 100 lb adsorbent). Under typical operating conditions with a concentration of 10 ppm residual water in Refrigerant-12, at a temperature of 140 deg F, this product has a 19 weight-% capacity, 19 times the capacity of the most widely used silica-type adsorbents.

More information? Circle Item 68 on postcard, page 89.

Larger Model Dust Collector

Designed to handle heavy-duty continuous grinding and other high dust volume sources is Model 123 dust collector, the largest cabinet-type collector now made by Torit Mfg. Co., St. Paul, Minn.

Handling as many as eight grinding wheels at a time, collector has a dust storage capacity of 10 cu ft and a filter area of 300 sq ft. Its 5-hp motor moves approximately 2000 cfm through an 8-in inlet at speeds of more than a mile a minute. Static pressure for this inlet is 3½ in. wg.

Other specifications: height, 115 in; width, 62¼ in.; depth, 26 in.; shipping weight, 1130 lb.

More information? Circle Item 69 on postcard, page 89.

Gas Wall Furnace Line

Its line of 8 Brilliant Fire vented gas wall furnaces is announced by Ohio Foundry and Mfg. Co., Steubenville, Ohio. Increased in-the-wall protection and development of a flame buffer are stressed.

Transmission of heat to surrounding wood construction within walls is prevented by the company's multi-channel wall box design which provides great air insulating space, sides and back. The flame buffer is a concaved insert of heat-resistant grey iron which crowns the entire combustion chamber interior. It takes the full impact of burner flame and endures continued heat shock. One-piece casting guarantees long life and absolute gas-tightness of the heating section from the burner to the flue.

Simple adjustment of telescoping liners provide fitting it to exact wall thickness. A forced-air Blo-Air unit, a separate attachment, plugs into 115-volt outlets, and is thermostatically controlled with a separate toggle switch for summertime operation.

More information? Circle Item 70 on postcard, page 89.

Soot Remover Is Spray Applied

A soot remover, Sootspray, that is packaged in a pressure-type can for easy spray application is available from Stewart-Hall Chemical Corp., Mt. Vernon, N. Y. Dispensing pressure in the push-button container is provided by Du Pont Freon propellent.

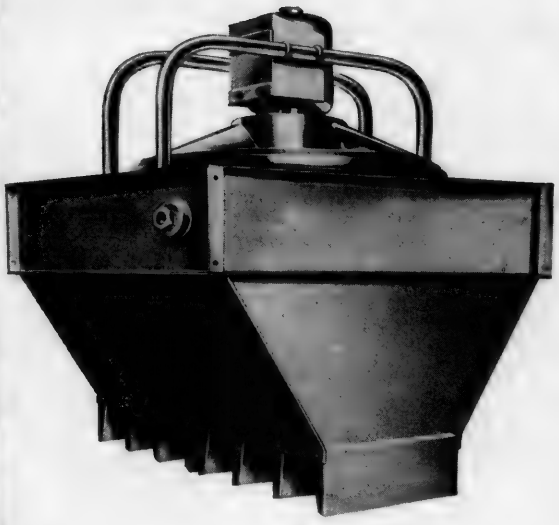
The sprayed chemical, which in itself is nonflammable, nonexplosive, and harmless to metal surfaces, simply acts on the soot to reduce its ignition point so it will be destroyed by burning. In effect, use of the product lowers the cost of heating by increasing efficiency of the furnace and getting more usable heat from the fuel.

While the spray will cause 99% of the soot to be burned away, the manufacturer says, it has no effect on fly ash, another product of incomplete combustion which must be removed periodically by vacuuming.

The product has a residual action which keeps it effective until needed in the furnace. In lowering the ignition point of carbon soot to the point at which it will burn, the spray does not increase furnace temperature sufficiently to cause damage to the burner or firebox.

More information? Circle Item 71 on postcard, page 89.

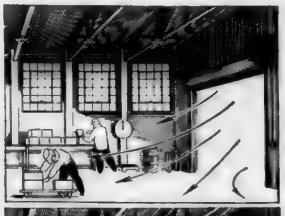
(Concluded on page 126)



open doors

in cold weather can cause labor unrest

...eliminate cold blasts with WING DOOR HEATERS



When large outside doors are opened in winter time

1—Cold drafts rush in.

2—Workers are chilled.

3—Health is endangered.

4—Production slows down.

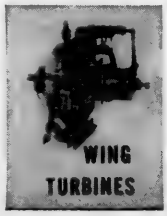
5—Heating system is strained.

Avoid these ill effects by installing Wing High Velocity Door Heaters.

As soon as doors are opened a curtain of hot air covers the open doorway. Workers inside then feel only a comfortable, warm gentle air movement. Wing Door Heaters use little steam as they operate only when doors are open. Actuation is by thermostat or a door switch or both. Write for Bulletin DH-2A.

L. J. Wing Mfg. Co. 158 Vreeland Mills Rd., Linden, N. J.
Factories: Linden, N.J. and Montreal, Canada
In Europe: WANSON, Haren-Nord, Brussels, Belgium

Wing
High Velocity
DOOR HEATERS



Mail this coupon for bulletin

L. J. Wing Mfg. Co. AC-1
158 Vreeland Mills Rd., Linden, N.J.

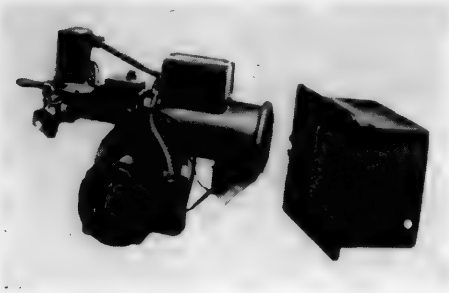
Please send me Bulletin DH-2A—Door Heaters

Name.....
Firm.....
Address.....
City.....Zone.....State.....

(Concluded from page 124)

Incinerator Burner

Completely packaged Series No. 600 SIB incinerator burners are announced by Eclipse Fuel Engineering Co., Rockford, Ill. Developed particularly for commercial and industrial incineration applications, six sizes of the series have rated capacities adjustable from 100,000 to 500,000 Btu per hr with a seventh size (636 SIB) having a capacity to 900,000 Btu per hr.



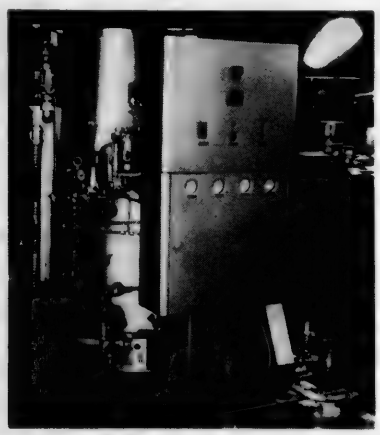
To put the completely packaged unit into operation requires only the hooking up of gas and electricity. An integral fan supplies all combustion air. Developing the soft, long, semi-luminous flame that is ideal for all types of incineration requires only simple manipulation of air and gas adjustments. A combustion temperature in excess of 1400 deg. F, normally desired for incineration purposes, is readily maintained by all units.

Installation is extremely simple. The preburned firebrick tuyere and cast iron flange may be bricked into the wall during initial construction. The remaining portion of the burner, as illustrated, is attached simply by means of the two ½-in. bolts supplied.

More information? Circle Item 72 on postcard, page 89.

Generator ¼ Standard Size

Capable of developing 200 lb steam pressure in 2 min from cold water, a steam generator with 99 sq ft of heating surface is announced by Vapor Heating Corp., Chicago, Ill. Called Vapor Modulatic Model 4615, it is rated at 60 brake horsepower.



Automatic controls cause the steam generator to cycle *on* and *off* and change the volume of steam produced to meet a changing steam demand, without any manual adjustment.

Servo control system regulates the fuel, feed water and combustion air, so that generator produces steam at about 80% efficiency at all levels of output. Working steam pressure may be changed from 75 to 300 psi by turning one control.

Overall dimensions are 84 in. long, 48 in. wide, 70 in. high, or about ¼ the size of conventional boilers of the same output. This is possible because the pressure-atomized fire in this steam generator releases considerably more heat per cu ft of combustion space than conventional boilers, and patented 337 ft steel coil is designed so that hot gases from the fire wipe over and around the coils so as to transfer heat efficiently to the water being pumped through the coils under pressure. A steam separator removes excessive moisture and water treatment particles from the steam so that 99% dry clean steam is directed through the stop valve to the steam line.

Burners are available for No. 2 fuel oil, natural gas, and combination oil or gas. Fuel may be changed by flipping one switch.

Steam temperature limit control, low water cut out, electric eye, safety valve, motor overload cut out, atomizing steam or air combustion switch cutout, and an excessive water pressure relief valve are all built into the machines, which are constructed in accordance with ASME, Hartford, and Underwriters specifications.

Each generator is a complete package which includes a 3 hp electric motor, blower, feed water pump, steam separator, fuel pump, and panel-mounted controls.

More information? Circle Item 73 on postcard, page 89.

All-Purpose Hot Water Generator

A new forced circulation boiler for low or high pressure hot water service is introduced by International Boiler Works Co., East Stroudsburg, Pa. Overcoming inadequacies of existing boilers, this International-La-Mont All-Purpose Hot Water Generator makes temperature differentials of as much as 80 deg F not only possible but practical for low pressure systems. In addition, it anticipates the growing trend towards higher temperatures and pressures for the heating of single buildings.

The availability of higher temperature differentials with the hot water generator means substantially reduced volume of water in the system. This, in turn, reduces the pipe size requirements for distribution and return lines, and makes possible a simplified distribution system. Fluid flow rate is also reduced which means lower horsepower or size requirements for the circulation pump.

Larger temperature differentials for single buildings also hold promise of significant fuel and operating economies through more effective use of available heat. Preheating of the cooler return water in the built-in counterflow economizer section decreases the temperature of the flue gases, and materially increases the efficiency of the boiler. In addition, this feature eliminates the possibility of thermal shock. The boiler has a design pressure of 900 psi, making water temperatures of 500 deg available.

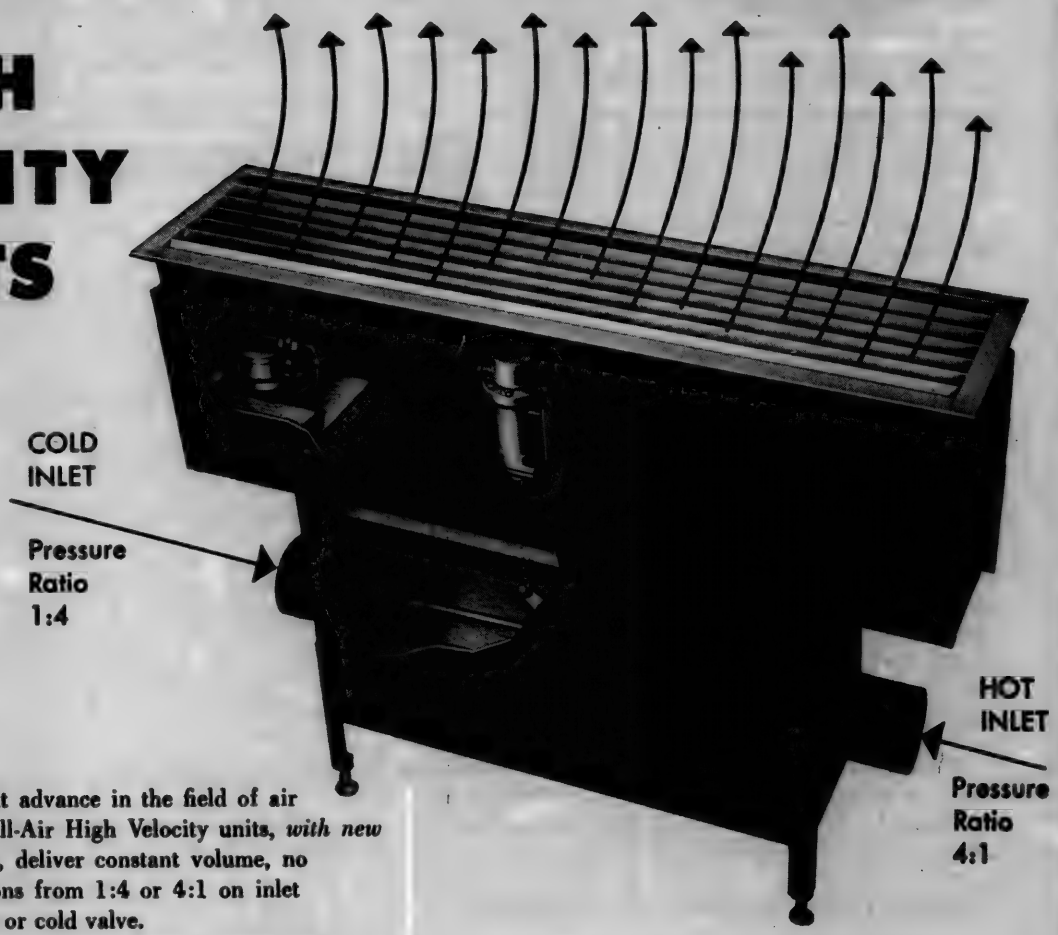
More information? Circle Item 74 on postcard, page 89.

ANEMOSTAT announces . . .

ALL-AIR

CONSTANT VOLUME

HIGH VELOCITY UNITS



Here is a vitally important advance in the field of air distribution. Anemostat All-Air High Velocity units, *with new simple automatic controls*, deliver constant volume, no matter what the fluctuations from 1:4 or 4:1 on inlet pressures of either the hot or cold valve.

Each unit is a single package including the controls and integral thermostats if required. There is complete accessibility of all controls through removable diffusers. No access panels are required. Capacities of CONSTANT VOLUME units can be pre-set at the factory.

These Anemostat CONSTANT VOLUME units

- Assure scientific draft-free distribution of air.
- Are available in 100% induction units.
- Include Anemostat die-cast metal rocket-socket valves. More than 50,000 of these valves are in service, and not a single one has needed maintenance.
- Operate on standard 15 lb positive acting compressed air systems.

See your nearby Anemostat representative for complete details on these revolutionary Anemostat All-Air CONSTANT VOLUME High Velocity units.

Anemostat: The Pioneer of All-Air High Velocity Systems

ANEMOSTAT®

DRAFTLESS *Aspirating* AIR DIFFUSERS

ANEMOSTAT CORPORATION OF AMERICA

10 EAST 39TH STREET, NEW YORK 16, N. Y.

Representatives in Principal Cities

(AG 1500)

BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

HEATING AND AIR CONDITIONING

Written primarily as a college textbook, Heating and Air Conditioning by Burgess H. Jennings, chairman, department of mechanical engineering, The Technological Institute, Northwestern University, may also be helpful to the practicing engineer. Emphasis is placed on heating and ventilating although consideration is given to year-round air conditioning. Problems are presented at the end of each chapter.

Chapters in this book include thermodynamics and steam and gas properties; air and humidity calculations; heat transfer and transmission coefficients; principles of steam heating; piping and steam system design; hot water heating; heat transfer elements; boilers, fuels and combustion; warm air heating; fluid flow, duct design, and air distribution systems; fans and air distribution; physiological reactions to heating and cooling; cleaning of air; panel heating; cooling load and air conditioning calculations; refrigerations and the heat pump; controls and control systems.

Heating and Air Conditioning by B. H. Jennings. Cloth bound, 6 x 9 inches, 598 pages. Published by International Textbook Co., Scranton 9, Pa. Price, $8.50.

MANUAL FOR RATING MOTOR FUELS

Committee D-2 of the American Society for Testing Materials has prepared the ASTM Manual for Rating Motor Fuels by Motor and Research Methods. The methods covered are the standard method of test for knock characteristics of motor fuels by the motor method (D 357) and the standard method of test for knock characteristics by the research method (D 908). Included are a number of appendices covering information for conducting standardized octane ratings on motor fuels.

ASTM Manual for Rating Motor Fuels by Motor and Research Methods. Cloth bound, 6 x 9 inches, 161 pages. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $6.75.

AMERICAN CIVIL ENGINEERING PRACTICE

Volumes I and II of a three-volume set on American Civil Engineering Practice is now available. They cover a wide range of the field, and each of the many sections was prepared by a specialist in the field. This set is intended to replace the American Civil Engineers' Handbook which was first published in 1919 and which by 1950 was considered obsolete because of the many new developments.

Volume I contains sections on metropolitan and community planning, surveying, traffic, highways, airports, railroads, soil mechanics and site planning, foundations, earthwork, tunnels and mathematical tables. Volume II is devoted to the general fields of hydraulic, sanitary and harbor engineering and has sections on hydraulics and pumping, hydrology, dams, river engineering, hydroelectric power, irrigation and land drainage, public water supply, sewage disposal, refuse disposal and harbor engineering.

American Civil Engineering Practice, edited by Robert W. Abbett. Cloth bound, 5½ x 8½ inches. Published by John Wiley & Sons, Inc., 440 4th Ave., New York, N. Y. Price, $15 each volume.

ALUMINUM DUCT GUIDE

A comprehensive treatment of the subject of aluminum ducts is available in Reynolds Aluminum Air Duct Guide which was prepared under the guidance of the following authorities: E. R. Queer, Queer & McLaughlin, State College, Pa.; Dr. Seichi Konzo, professor of mechanical engineering, University of Illinois; G. A. Voorhees, technical secretary, National Warm Air Heating & Air Conditioning Association, and others.

Of interest to the engineer is the chapter on the design of aluminum air ducts, covering calculation of heat gain and loss, heat transmitting surface areas, and a sample design calculation.

Included is an estimating guide for residential, commercial and industrial aluminum air ducts. It shows how to keep records to aid in cost estimating.

One chapter has detailed information on how aluminum air ducts are installed, with detailed step-by-step recommendations for adjusting air circulation in the system. Another chapter covers the fabrication of ducts with sections on shop practice, hints for working aluminum sheet, data on joints and seams, and welding.

A large amount of technical data has been presented for the designer and the man concerned with duct installation.

Reynolds Aluminum Air Duct Guide. Paper cover, spiral binding, 8½ x 11 in., 129 pages. Published by Reynolds Metals Co., 2500 S. 3rd St., Louisville, Ky. Available free by writing to Reynolds on your company letterhead.

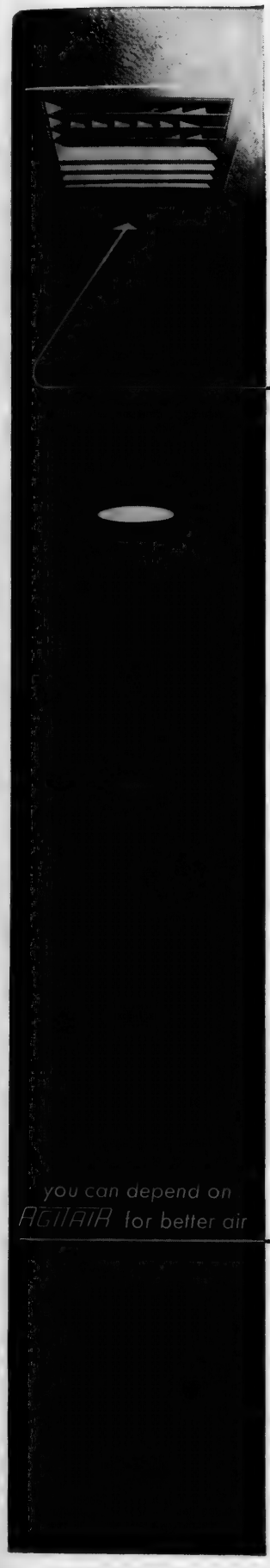
REFRIGERATING DATA BOOK

The sixth edition of the Air Conditioning-Refrigerating Data Book, Applications Volume, of the American Society of Refrigerating Engineers, was written by 90 experts in the field. Willis R. Woolrich, dean, College of Engineering, University of Texas, was editor-in-chief.

This volume includes design information, formulas, tables, diagrams and sample engineering calculation of interest to application engineers, consulting engineers and others.

Authors of the 60 chapters, and the associate editors, were chosen because of their experience and eminence in their particular fields. All material for the book had a critical review by the ASRE Technical Committee to insure accuracy.

Air Conditioning-Refrigerating Data Book, Applications Volume, 6th Edition, editor-in-chief, W. R. Woolrich. Cloth bound, 6½ x 9 inches, 1100 pages. Published by the American Society of Refrigerating Engineers, 234 5th Ave., New York 1, N. Y. Price, $10.



Custom Made

AIR DIFFUSERS with DIFFUSING VANES

Each AGITAIR square and rectangular air diffuser is custom designed to meet your requirements of air flow and interior treatment.

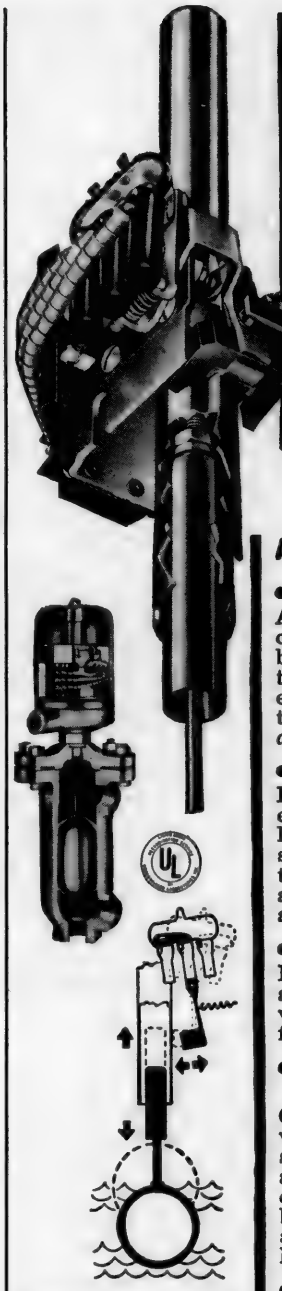
These AGITAIR diffusers have built-in diffusing vanes, scientifically arranged in unlimited louver patterns to provide certified 100% draftless air distribution from any ceiling or wall location.

AGITAIR Catalog R-107 shows you how to select the proper size and pattern for your job conditions.

Write for your copy today.

you can depend on AGITAIR for better air

AIR DEVICES INC.
185 MADISON AVE., N. Y. 16, N. Y.
air diffusers • filters • exhausters



A magnetic sleeve, raised and lowered within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

WHY you are SAFER with MAGNETROL BOILER WATER LEVEL CONTROL

A Few of MANY Reasons:

• Operating Life Is Practically Unlimited
A PERMANENT Alnico magnet, located *outside* the float chamber, links boiler water level and electrical controls. This simpler magnetic link eliminates mechanical parts subject to wear and fatigue failure. *Pioneered and perfected by Magnetrol.*

• Customized Corrosion Control
Floats can be fabricated from a variety of materials to meet any "special" local corrosion problems. Type 304 stainless steel floats have proven over the years to have the greatest all-around corrosion resistance, and so are furnished as standard.

• "No-Scale" Float Chamber Liner
Exclusive self-cleaning brass liner actually "flexes" off corrosion—prevents scale growth and "sticking" of float.

• Up to Three Switches—an Exclusive Safety Feature
Only MAGNETROL design can provide up to three completely separate switch mechanisims, each operating at its own level, in a STANDARD control. Use extra switch for "stand-by" pump for emergency use; or alarm BEFORE fuel cut-off; or high level alarm; etc.

• Least Maintenance
Once-a-shift blow down and once-a-month visual inspection of switch housing are only regular maintenance. *Built SAFE, Magnetrols stay SAFE.*

We offer STANDARD Magnetrol Boiler Water Level Controls for service at temperatures up to 750°F., at pressures up to 600 psi., for single stage or multi-level stage service with up to three separate switching actions. Special units available for more extreme requirements.

MAGNETROL, Inc. Mail the Coupon Now for Full Facts

MAGNETROL, Inc., 2106 S. Marshall Blvd., Chicago 23, Ill.

Gentlemen: Please send me Catalog Section III and full information on Magnetrol Boiler Water Level Controls.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

NEWS OF THE MONTH

AIR CONDITIONING MARKET

to make vast gains, according to Cloud Wampler, Chairman of the Board, Carrier Corp. Figures given.

Growth of the air conditioning industry and predictions of future sales volume were made by Cloud Wampler, chairman of board, Carrier Corp., in a talk as part of the official opening of new engineering laboratory facilities of the company's Unitary Equipment Division at Syracuse, N. Y.

• **ROOM AIR CONDITIONERS**—In 1952, sales of room air conditioners totalled 412,000 units and this was more than doubled in 1953 to 950,000 units. In 1954 so many newcomers had entered the field, that there were over 100 brands on the market. That year sales had increased to 1,100,000 units and there was an inventory carry-over of some 700,000 room units. In 1955, sales jumped to about 1,450,000 units. In 1956, the industry moved towards greater stability and the total sales were 1,550,000 units. Inventories are up but not to a dangerous point and the number of brands has dropped to half of the ones that existed one year ago.

He predicted that by 1957 unit sales would be up to 1,600,000 units and by 1961, the retail sales would climb to 2,150,000 units at a total dollar volume of $756 million.

• **CENTRAL SYSTEMS FOR HOMES**—Central air conditioning for residences has been the fastest growing portion of the air conditioning industry, according to Mr. Wampler. In 1952 the industry sold 15,000 such systems; in 1953, 50,000 systems; in 1954, 75,000 systems and in 1955, 125,000 systems. For the current year it is expected to reach 175,000 systems having a retail value of about $262,000,000. During 1957, about 250,000 such systems will be installed at a retail value of some $375 million. This will expand to 600,000 residences in 1961 with a retail value of $900 million. For 1966, the annual figure will increase to 1,200,000 at a retail value of about $1.8 billion.

• **AIR CONDITIONED HOMES**—In the South, 43% of all homes costing $20,000 and over are equipped with air conditioning; 11% of the $15,000 to $20,000 homes are so equipped and 13% of the $12,000 to $15,000 homes. Air conditioning will move through the area of low-priced home selling from $8,000 to $12,000.

• **PICTURE FOR 1956**—The retail dollar volume for the air conditioning industry in 1956 is expected to be as follows: Room air conditioners, $426 million; self-contained equipment, $215 million; residential systems, $262 million; applied or built-up systems, $1,048 million; heating equipment adaptable to air conditioning, $638 million; all other, $575 million making a total of nearly $3.2 billion.

• **PICTURE FOR 1957**—This is expected to change the following year to room air conditioners, $440 million; self-contained equipment, $238 million; residential, $375 million; applied systems, $1,190 million; heating installations adaptable to air conditioning, $650 million; all others, $600 million or a total of nearly $3.5 billion.

• **FIVE YEARS HENCE**—Looking ahead for 5 years, the figures will change to: Room air conditioners, $600; self-contained equipment, $300 million; residential systems, $900 million; applied system, $1,600; heating system adaptable to air conditioning, $750 million; all others, $750 million. Total volume for the air conditioning and refrigeration industry, $5 billion.

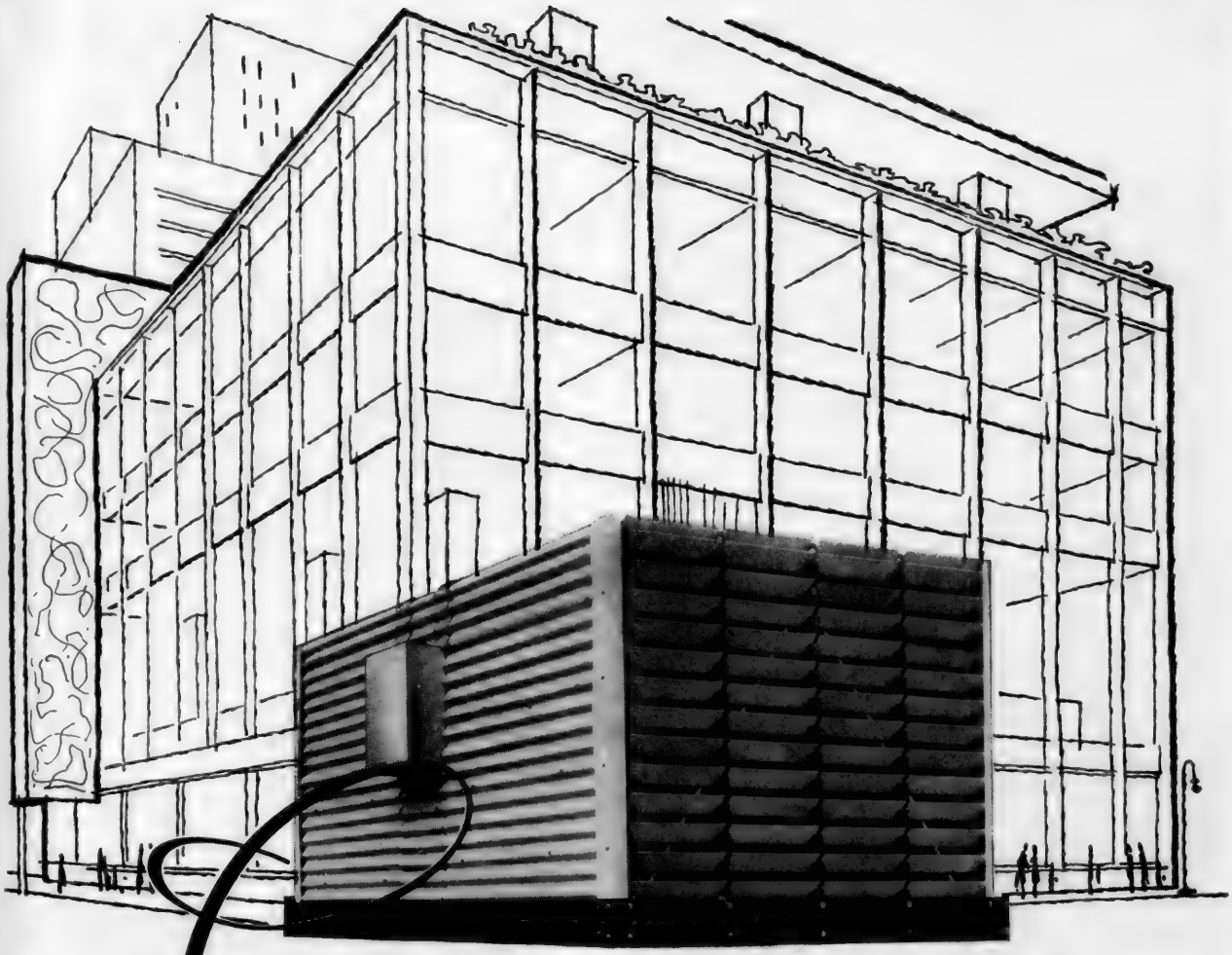
REFRIGERATING ENGINEERS

hold semi-annual convention in Boston, Mass. with four technical sessions and two conferences.

More than 500 members and guests attended the semi-annual meeting of the American Society of Refrigerating Engineers held in Boston, Mass., November 26 to 28 — to participate in the various technical sessions and conferences arranged by the program committee. The program included four technical sessions, a conference dealing with field installation practices and problems, domestic refrigerator engineering, and an air conditioning conference.

(*Continued on page* 132)

These are basic components of an electronic system designed by The Babcock & Wilcox Company and Bailey Meter Company to analyze operation of steam generating boilers. Scanners, the four smaller units on steel frames, gather data from sensing elements located at different parts of boiler. Digitizer, at operator's back, receives data from scanners, converts it from electrical values to digits. Upper cabinet in center stores data and feeds it to perforator (top) where information is punched in code on continuous tape. Tape readings are transmitted by teletype to an electronic computer in New York City. Translated automatically into code suitable for computer use, the information is processed mathematically and transmitted back to the boiler site for application by engineers and technicians. Lower cabinet in center is synchronizer, which directs operation of scanners and acts as control center for system.



DOUBLE-FLOW AQUATOWERS* ARE

Complete...

When reviewing submittals on intermediate capacity cooling towers it pays to make certain that all essential elements are included. For example, do they include such vital tower components as diffusion decking . . . drift eliminators . . . access doors . . . adequate fan cylinders? Without these basic parts, no tower can be complete.

When you receive submittals on Marley Double-Flow Aquatowers, you can automatically be sure that "it is all there" — that there is nothing extra to buy. Every cooling tower component that contributes to better performance, greater economy and simpler maintenance is *standard equipment* on Double-Flow Aquatowers.

The performance you get out of your cooling tower depends on what goes into its design and construction. In a Marley Double-Flow Aquatower, there is no compromise with quality, no "shortcuts" that prove expensive in the long run. That's why the Double-Flow Aquatower is the overwhelming first choice of architects, contractors, engineers and owners who require commercial or institutional water cooling equipment.

*Registered Trade Names

The Marley Company MARLEY · Kansas City, Missouri

• **BUSINESS**—At the general assembly luncheon, charters were presented to the following new sections: Wichita, Kans.; Birmingham, Ala.; San Antonio, Tex.; Central Pennsylvania Section; and the Mohawk Valley Section.

The Chicago trophy, which is awarded annually to the section which has the greatest percentage increase in membership, was presented to the Montreal Section.

• **NEW MEETINGS**—The 1957 annual meeting will be held at the Hotel Fountainebleu, Miami, Fla., June 3 to 6. The 1957 semi-annual or winter meeting will be held in Chicago. The 1958 annual meeting will be a joint convention with the ASHAE in Minneapolis, Minn. The winter or semi-annual convention that year will be held in New Orleans, La.

Following are abstracts of some of the papers:

• **CONDENSATION OF VAPOR**—Jack B. Caddock, assistant professor of mechanical engineering, Massachusetts Institute of Technology, spoke on Film Condensation of Vapor in a Horizontal Tube. When the vapor condenses inside of the tube, as in the air cooled or evaporative condensers common to the refrigeration industry, there is some deterioration of the average heat transfer coefficient. This is because of the lower cross section of the tube being filled with condensate which acts to reduce almost completely the heat transfer through the area which it covers. An empirical equation was developed for predicting the tube area filled by the condensate. The Nusselt theory can then be applied to remaining tube surface to determine the average heat transfer coefficient of the condensing film.

• **GRAPHICAL HEAT TRANSFER DETERMINATION** — A method for determining the wet heat transfer surface temperature of an air coil graphically on the psychrometric chart was explained by Tamami Kusuda, research engineer, Air Conditioning and Refrigeration Division, Worthington Corp. The capacities of a given coil can be calculated on the basis of log mean temperature difference and log mean enthalpy difference of the air stream and refrigerant temperatures. But the log mean values cannot be determined unless the leaving air condition is previously known. The design of a coil demands a capacity evaluation for various given combinations of entering air conditions and air flow rate without specifying the leaving air conditions. For the case of a wet surface coil, a knowledge of the true coil surface temperature is an essential factor in estimating the coil capacity.

• **MERCURY JET SWITCH**—W. R. Davis, Research Department, Detroit Controls Corp., presented a brief historical summary of high speed switches. He mentioned the technical limitations of mechanical and electronic switches, and pointed out the advantages of the high speed commutator as a logical element in electrical systems. Perhaps most significantly, the practical high speed switch allows the synthesis of monitoring systems which makes use of the oscilloscope display to present a continuous, nonflickering picture or profile of an extended process or system, thus allowing the operator to gain immediate and accurate insight into the overall system.

• **BETTER HUMIDITY CONTROL**—How Cycling Rate Affects Humidity Control was explained in a paper by J. E. Janssen, research engineer, and Dr. P. E. McNall, Jr., research head of Minneapolis-Honeywell Regulator Co.

The theory presented showed that the dehumidifying characteristics for a system cycled with 50% *on* time will vary as a function of the length of the cycling period. Based on the assumption that the time constant for the coil temperature change is less than the time constant for the room-air temperature change, the theory predicts an intermediate cycling rate which corresponds approximately with an *off* period just long enough for the coil to dry, where the dehumidifying characteristics will be poorest. Longer cycling periods will produce lower average humidity levels. Shorter cycling periods will produce lower average humidity levels as well as smaller temperature and humidity swings.

Current experimental studies have confirmed the shape of the curves, but there is still some discrepancy between the experimentally determined point of least dehumidification and the conditions observed in actual installations.

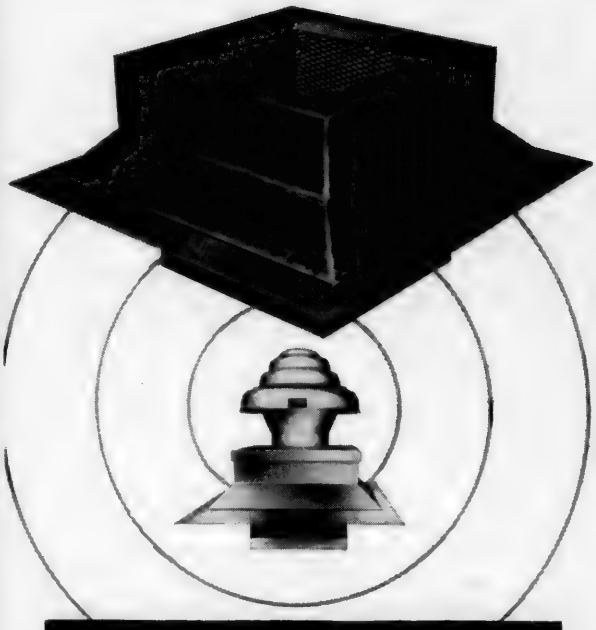
• **POWER USAGE VARIATIONS**—Results of studies of 30 houses were contained in a paper by Ralph A. Gonzales, Airtemp Division, Chrysler Corp., on Power Usage Variations for Summer Air Conditioning of Identical Residences. All houses in the study were built at the same time, with the same amount of glass, the same cooling and water heating equipment, and the same type of orientation. The following conclusions were drawn after examination of the data:

1. There are wide variations in power used for air conditioning just as there are variations in residential power used for other purposes in identical houses. In terms of high consumers, the low consumers used less than one-half as much power for air conditioning identical houses.
2. There is not any definite relationship between the power used for air conditioning purposes. In other words, the higher power consumers in the non-air conditioning months are not always the high users of power for air conditioning.
3. Many of the homeowners are currently exercising considerable manual selection of operating time on their air conditioning equipment. There is not any evidence that the usage variations are motivated by reasons of economy any more than by reasons of personal preference. For example, if economy were the major consideration, it would seem reasonable to expect the power consumed for air conditioning to bear a closer relation to the power consumed for other purposes.
4. The variations in power use due to the operating preferences of the homeowners are currently of such magnitude that field testing for differences in equipment and construction effects cannot be expected to yield conclusive answers.

• **EMISSIVITY**—A research program under the auspices of the Snow, Ice and Permafrost Research Establishment of the U. S. Army Corps of Engineers brought forth some information on Emissivity of Ice, Snow and Frozen Ground, presented in a paper by R. V. Dunkle, associate professor, J. T. Gier, associate professor, and J. T. Bevans, Jr., research engineer, all of the University of California. A special instrument was developed for low temperature emissivity measurements. It is a type of radiometer and

(*News of the Month continued on page* 134)

NEW...
for sound reduction...



THE PENN VENTILATOR

SONOTROL

SOUND BARRIER

CURB

Noise reduction problems are prevalent in every industry. Penn contributes toward the minimizing of fan noises by its revolutionary new Sonotrol Curb. In effect, this device helps to reduce sound build-up at the source. Build-up is developed by any roof fan regardless of how expertly engineered or finely balanced.

Penn's Sonotrol Curb completes the roof ventilator specification. Curb construction on the job is no longer necessary now that this factory fabricated accessory is available.

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I would like to receive complete data. ( )
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(Division of National-U.S. Radiator Corporation)

while the original objective was to develop a radiometer suitable for field use, all data to date have been obtained in the laboratory.

Equations for computing the emissivity are derived in the paper, and the authors describe the technique used in making the measurements. Emissivities are reported for snow, ice, frozen earth and some miscellaneous materials at temperatures below 32 deg. The data show a definite decrease in the emissivity of ice and snow as the particle size is decreased.

• **TOWER SELECTION**—A universal Counter-flow Cooling Tower Selection and Performance Chart was described by John Engallitcheff, Jr., president, Baltimore Aircoil Company. The new chart permits the selection of a cooling tower and the prediction of its performance. With one test taken at any operating condition, it is possible to determine if the tower is delivering its rated capacity and to predict the tower's performance at any other operating condition.

• **EFFECT OF FROST FORMATION**—W. F. Stoecker, assistant professor of mechanical engineering, University of Illinois, presented a paper on How Frost Formation on Coils Affects Refrigeration Systems. He said, "When a finned coil collects frost, the performance is impaired primarily because the frost restricts the air flow, and only secondarily because of the insulating effect of the frost. The rate of air flow is, therefore, the best indicator of when to defrost the coil."

For intelligent design and operation, the effect of frost on the performance of a system should be known. In order to compensate for the reduced performance under frosted conditions, the designer should know just how much additional coil capacity to install. In addition, the user of the system should know when to defrost the coil for economy.

• **OIL AND FREON**—L. F. Albright, associate professor of chemical engineering, Purdue University, and A. S. Mandelbaum, Atlantic Refinery Co., Dallas, Tex., prepared a paper on Solubility and Viscosity Characteristics of Mixtures of Lubricating Oils and Freon-13 or -115.

When lubricating oils are used in refrigeration compressors, the oils generally have some contact with the refrigerants. Freon refrigerants absorb in lubricating oils to significant extents and change the properties of the oil, especially the viscosity. Data were obtained and correlated for the solubility and viscosity characteristics of Freon-13 and -115 and, to a limited extent, Freon-22 and representative lubricating oils. Appreciable amounts of each Freon were absorbed in all oils tested and caused a significant reduction of the viscosity. For a given temperature and pressure, Freon-22 was the most soluble and caused the largest reductions in viscosity. Freon-13 was the least soluble. The paper presented a method for extrapolating the present correlations to different operating conditions, oils, and possibly Freons.

• **CAPILLARY TWO-PHASE FLOW**—Capillary Two-phase Flow was discussed in a paper by H. A. Whitesel, Amana Refrigeration, Inc. Formulas were developed for calculating the mass flow of Freon-12 through capillaries under flashing conditions when the entering fluid is either saturated liquid or a mixture of gas and liquid. Approximations were made in the solution of the general flow formula, but its accuracy is considered sufficient for general design use. An empirical two-phase friction factor formula was given for the range of conditions under which the tests were run. A partial check on the ratio of the frictional resistance to that caused by acceleration was obtained by testing an .070 in. ID capillary in lengths varying from 3 in. to 10 ft.

The slug flow theory used in the mathematical derivation of the refrigeration capillary two-phase flow formula was first tried out by deriving an equation on this basis for a non-condensible gas and a non-volatile liquid and checking this against tests with air and water. A limited amount of test data correlated with results of the formula showed good agreement when the theoretical friction factor was multiplied by a constant.

• **OILS AND GENETRON 141**—A paper was prepared by Dr. Walter O. Walker, A. A. Sakhoovsky, research assistant professor, and Shelvin Rosen, research instructor, all of the University of Miami, on Behavior of Refrigerant Oils and Genetron 141.

The talk covered the miscibility of Genetron 141 and the oils most frequently used in the refrigeration industry. Discussed in detail is the method used to determine the phase diagrams and the various phenomena. The use of the phase diagram to determine not only the solubility but also the relative depths of the refrigerant and oils and the concentrations of refrigerant and oil in each layer are explained. Briefly covered is the difficulty of obtaining wax separation data for Genetron 141-oil mixtures and the manner in which these mixtures differ from Genetron 12 mixtures with oil.

• **AIR CONDITIONING CONFERENCE**—As part of an air conditioning conference, Paul C. Wyckoff spoke on the value of in-the-wall room air conditioning systems versus central systems for apartment houses. These new units are designed with separately installed sleeves which can be mounted in the building under a window at the time the building is constructed.

Some of the benefits are lower initial cost for air conditioning apartment buildings and residences; lower maintenance costs (the plug-in feature permits easy removal for service); individual room temperature control; air conditioning provided for various types of liquid heat systems; fresh air supply easily obtained; removal or addition of air conditioning with change of tenants is easily arranged; no blocking of window area; failure of one unit has no effect on the rest of the system; power consumed by individual tenant can be directly metered to him.

John B. Soule, manager, Commercial Heating-Cooling Systems, American Radiator and Standard Sanitary Corp., described a through-the-wall air conditioning unit with integral heating coil which can be installed in existing apartments or hotels without loss of revenue. He pointed out that this system provides extremely flexible operation for either heating or cooling, and that it is an effective solution to the problem of intermediate-season operation. Heating and cooling are under thermostatic control.

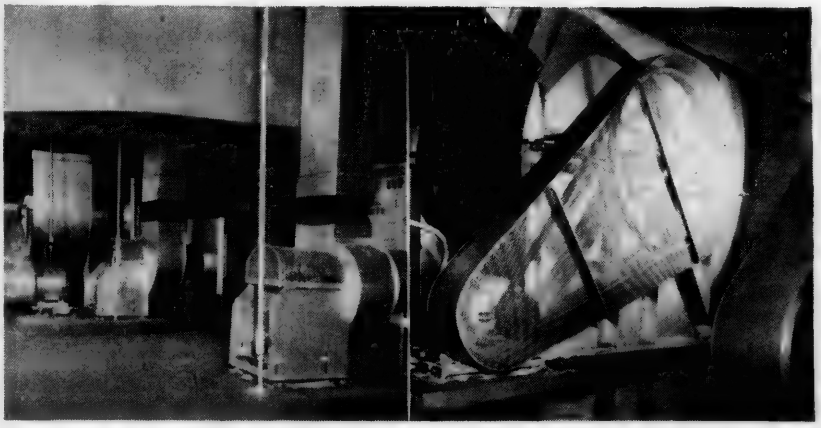
(*News of the Month continued on page* 148)

"MASSACHUSETTS goes to school"

A conventional design school showing Massachusetts fan installations, as a contrast to our recent "Banjo School" ad. These two schools present an interesting comparison, in that marked differences are numerous, such as open courts, corridor intersections, stairs and traffic to and from all activities.

Having 39 class rooms, this school accomodates 3100 pupils, auditorium seats 1200, 1100 cafeteria, 4,676,000 cubic feet, 314,780 square feet.

Martin Van Buren High School, Queens, New York



THERE ARE THIRTEEN FANS IN THIS ROOM. A TOTAL OF THIRTY-SEVEN MASSACHUSETTS FANS SERVICE THE ENTIRE SCHOOL.

AUDITORIUM SUPPLY AND EXHAUST FANS ARE MASSACHUSETTS SQUIRREL CAGE TYPE WITH 65-¾" DIAMETER WHEEL.

EGGERS & HIGGINS
Architects
WEISKOPF & PICKWORTH
Structural Engineers
SYSKA & HENNESSY
Mechanical Engineers
CARISTO CONSTRUCTION CORP.
General Contractors
DANIEL J. RICE, INC.
Heating & Ventilating Contractors

PRESIDENT BOARD OF EDUCATION OF THE CITY OF NEW YORK
Arthur Levitt
SUPERINTENDENT OF SCHOOLS
William Jansen

The BISHOP & BABCOCK Mfg. Co.

NEW CATALOGS

Use the prepaid postcard on page 89 for securing your copies of catalogs described in this department.

RETURN GRILLES AND REGISTERS—Bulletin 201, describing its line of return air grilles and registers, is announced by Tuttle & Bailey Div. of Allied Thermal Corp., New Britain, Conn. Included are a size selection chart giving air capacities in fpm and anemometer effective area, complete price lists, and a list of the company's branch offices and authorized representatives throughout the country. .....**Item 75**

MUSHROOM POWER EXHAUSTER—A 4-page bulletin, CAM-103, that describes its axial mushroom power exhauster is available from Chicago Blower Corp., Franklin Park, Ill. Performance tables, illustrations, and application information covering all operating facets of the low, mushroom-shaped roof fan are presented. **Item** **76**

INDUSTRIAL OIL BURNER—How its Econol low pressure air atomozing 60 and 84-hp industrial oil burners can save you 30% in fuel costs by using heavy No. 5 oil is detailed in Bulletin ID-56-216 published by York-Shipley, Inc., York, Pa. A detailed specification table is included. .....**Item 77**

TEFC MOTORS—Latest design features of its totally-enclosed, fan-cooled motors in NEMA rerated ratings of ½ to 30 hp, Type GZ, and in non-rerated ratings of ½ to 100 hp, Type APZ, are described in Bulletin 51B-7225D published by Allis-Chalmers Mfg. Co., Milwaukee, Wis. In addition to cutaway views of the motor, the bulletin includes tables of ratings and dimensions as well as a horsepower frame chart. .....**Item 78**

CIRCUIT BREAKING, FUSING—A method of co-ordinating molded case circuit breakers with current-limiting fuses for protecting low-voltage feeder circuits against fault currents up to 100,000 amp (RMS asymmetrical) is described in 8-page Bulletin GEA-6569, issued by Circuit Protective Devices Dept., Gen. Electric Co., Plainville, Conn. .....**Item 79**

INSULATING FIREBRICK—For buyers and others involved with the manufacture of structural clay products, in both salt glaze and non-glaze periodic kilns, 8-page Bulletin R-43 is published by Refractories Div., The Babcock & Wilcox Co., New York, N. Y. A detailed description of the relationship between heat losses and the weight of refractory linings, results of studies performed on a number of producing installations, is included as evidence of the fuel savings made possible by the use of light weight insulating firebrick. .....**Item 80**

TEMPERATURE CONTROL MANUAL—Third in its series of pocket-size manuals that the company is preparing on automatic comfort controls, Booklet SA 2476 is designed for servicemen and installers of the Moduflow system developed by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The system regulates indoor comfort according to outdoor weather conditions. Included are a trouble-shooting guide, schematic wiring diagrams, and calibration information on line and low-voltage systems with and without automatic night-temperature set-back. ..**Item 81**

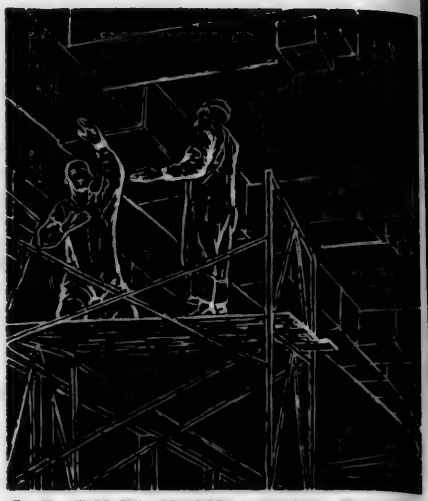
SCOTCH TYPE BOILERS—Two catalogs, No. 819 and 820, that describe scotch type steel boilers for oil or gas firing are available from National-U. S. Radiator Corp., Johnstown, Pa. The first illustrates Type SF wet-back boilers for use with oil, gas, or gas-oil forced draft burners; the companion catalog with Type SN for oil or gas firing with natural draft. Both catalogs show cut-away illustrations to portray boiler design and operation features, and list storage and tankless type domestic hot water heaters for use with the line. Dimensional drawings, ratings, capacities, recommended burner sizes and conventional engineering data also are presented. .....**Item 82**

MINIATURE GAS APPLIANCE PILOT—A miniature gas appliance pilot, designed for use in ranges, laundry dryers, water heaters and wall heaters, is described in Bulletin GS-76 available from Robertshaw-Fulton Controls Co., Long Beach, Calif. Information is provided concerning the operation and installation of the pilot. There is also a detailed cutaway diagram of the device. .....**Item 83**

FUEL BURNING SYSTEMS—Six-page Bulletin 1231-A on fuel burning systems is available from Orr & Sembower, Inc., Reading, Pa. Systems described are complete, packaged combustion assemblies utilizing gas, oil, or combination gas-oil firing for modernizing or converting existing boiler equipment, or for obtaining efficient operation from new equipment. Three actual installations of the equipment are pictured and described in detail. Illustrations indicating how the units appear fully assembled are also provided. Charts list components available in each of the various models of fuel burning equipment. Tables are given for fuel firing arrangements and maximum firing rates. .....**Item 84**

PAD-TYPE MACHINERY MOUNTS—Illustrated data sheet, Bulletin K2D, describing vibration and noise-absorbing machinery mounts, is available from The Korfund Co., Inc., Long Island City, N. Y. Information is given on the company's Elasto-Rib, the isolating medium. Construction and installation diagrams of the company's universal damper, with dimension and loading capacity tables and prices are included. .....**Item 85**

(*Continued on page* 138)



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CHARLESTON, W. Va., Baldwin Asbestos Products Co.
CHARLESTON HEIGHTS, S. C., Stafford Insulation Co.
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JACKSON, Miss., Paine Refrigeration Supply Co.
JACKSONVILLE, Fla., Ferber Sheet Metal Works, Inc.
JOPLIN, Mo., Joplin Cement Co.
KANSAS CITY, Kelley Asbestos Co.
LITTLE ROCK, Gunn Distributing Co.
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Plant Insulation Co.
LOUISVILLE, General Insulation & Roofing Co.
MADISON, Wis., J. D. Wilson Co.
MEMPHIS, John A. Denie's Sons Co.
MIAMI, Southern States Iron Roofing Co.
MILWAUKEE, J. D. Wilson Co.
MINNEAPOLIS, Asbestos Products, Inc.
MOBILE, Ala., Shook & Fletcher
NASHVILLE, Southern States Iron Roofing Co.
NEWARK, N. J., Eastern Steam Specialty Co.
NEW HAVEN, Conn., Insulation Supply Co.
NEW ORLEANS, Eagle Asbestos & Packing
NEW YORK, Eastern Steam Specialty Co.
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OMAHA, Cardinal Supply & Mfg. Co.
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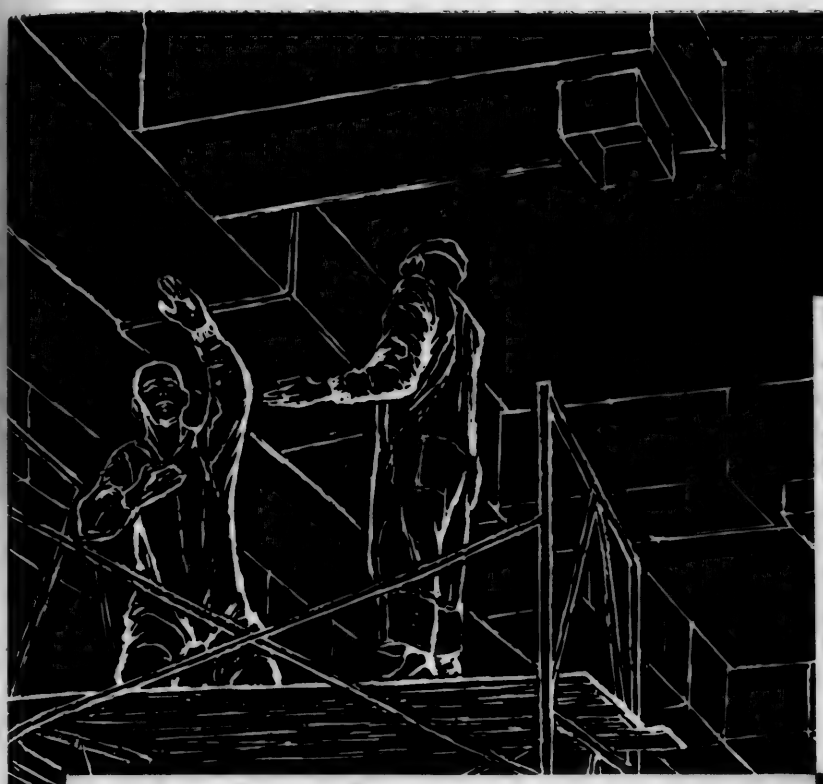
PITTSBURGH, Dravo Corp.
PHOENIX, Ariz., Kircher Asbestos & Rubber Co.
RALEIGH, N. C., Southern States Iron Roofing Co.
RICHMOND, Va., Southern States Iron Roofing Co.
ROCKFORD, Ill., Mott Brothers Co.
SALT LAKE CITY, Bullough Asbestos Supply Co.
SAN ANTONIO, The Bracken Co.
SAN DIEGO, Western Fibrous Glass Products
SAN FRANCISCO, Western Fibrous Glass Products
SAVANNAH, Ga., Southern States Iron Roofing
SCHENECTADY, N. Y., Jon Tree Sales & Supply Co.
SEATTLE, Western Fibrous Glass Products
ST. LOUIS, A. G. Brauer Supply Co.
ST. PAUL, Asbestos Products, Inc.
SYRACUSE, N. Y., Industrial Supply Co.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TALLAHASSEE, Fla., Capital Refrigeration & Supply
TULSA, Okla., Ball Distributing & Engr. Co.
TUPELO, Miss., Paine Supply Co.
WASHINGTON, Walter E. Campbell Co., Inc.
WICHITA, General Metals, Inc.
VANCOUVER, B. C., Fleck Brothers Limited

GUSTIN BACON gb



Easy to cut or score with a knife; easy to install neatly and quickly. Won't absorb moisture or corrode metals.

GUSTIN-BACON announces New Duct Insulation Board

G-B INSULATION BOARD is a semi-rigid insulation board of fine spun mineral fibers bonded together with a thermo-setting resin. It is ideal for use on all types of heating, ventilating, air conditioning or combination ducts where neat appearance and superior thermal efficiency are required.

G-B Insulation Board has a clean, smooth surface that can be spray-or-brush-painted or coated with weatherproofing compounds. For cooling or combination duct use, it comes with factory-applied vapor barrier facing.

Try this new insulation on your very next job. You'll be more than pleased with its performance, appearance and applied cost. A nation-wide network of G-B Distributors stock G-B Insulation Board, as well as G-B ULTRALITE Glass Fiber Duct Insulation and Duct Liner.

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Thermal and acoustical glass fiber insulation. • Pipe coverings and fittings

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DIFFERENT?
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NEW POWER GAS BURNER FILLS IMPORTANT NEEDS

Be *sure* you know about SYNCRO/FLAME whenever you have a job that calls for a good forced-draft gas burner! This one is designed for boilers in the range of 10 to 150 h.p. It comes in seven sizes, of different capacities, and it is outstanding for unusual and valuable features. Among them are . .

NON-PULSATING FLAME
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Adept engineering has achieved a flame that positively does *not pulsate* on starting or stopping, thus completely removing a common objection. Also, a new control circuit virtually eliminates *any* chance of explosion, even under conditions of bad misadjustment. Circuits are also provided for pre-purge, post-purge, and graduated light-off. *Certainly*—a *great* power gas burner!

WRITE FOR LITERATURE

Write today for circular describing all features and giving full specifications. Ask for Bulletin 553.

MANUFACTURERS OF OIL AND GAS AND OIL/GAS BURNERS
SYNCHRONOUS FLAME, INC.
WALWORTH • WISCONSIN

NEW CATALOGS

(*Continued from page* 136)

Use the prepaid postcard on page 89 for securing your copies of catalogs described in this department.

STEAM TO WATER CONVERTER—Bulletin 50, covering a complete line of U-tube steam to water converters, is issued by Davis Engineering Corp., Elizabeth, N. J. Capacity tables have been arranged to allow easy determination of converter size. A new step-by-step method has been devised to simplify selection. Units for radiant heating applications have been listed separately. .....**Item 86**

SEWERAGE CONSTRUCTION PROBLEM—A case history report on the problem of infiltration and exfiltration in new sewerage construction and existing systems is prepared by Robinson Clay Product Co., Akron, Ohio. Illustrated, 4-page Bulletin R-656-9 describes its wedge-lock clay pipe joint, its application in a typical installation in which infiltration and exfiltration problems existed. The technique of installation of the wedge-lock joint with special adhesives is explained. **Item** **87**

CONDENSER APPLICATION—Data for selection of its condensers as evaporative water coolers, information on how to select and size multi-circuits, material showing the use of hot-dipped galvanized modulating dampers to avoid low head pressure due to air temperature drops, or reduction of load on condenser, are included in Catalog 30C6a issued by Refrigeration Engineering, Inc., Los Angeles, Calif. Also there are capacity tables, dimensions, fan tables, information on desuperheat coils and typical specifications for ammonia, F-12 and F-22 condensers. **Item** **88**

COIL SURFACE CONDITIONERS—Bulletin 133 describes coil surface type air conditioners for industrial and commercial applications manufactured by Niagara Blower Co., New York, N. Y. Machines illustrated are offered in capacities from 41,500 to 1,680,000 Btu per hr. .....**Item 89**

FIELD SERVICED COMPRESSORS—Field serviceable hermetic compressors available for use in packaged chillers, air conditioners, and commercial refrigeration units, are the subject of Bulletin C-1100-B93 P, offered by Worthington Corp., Harrison, N. J. Available in 2 to 7½-hp sizes, the compressors' features, component parts, specifications and dimensions are covered. .....**Item 90**

MINIATURE SHIELDED THERMOCOUPLES—A bulletin on newly-designed miniature shielded thermocouples is now available from Thermo Electric Co., Inc., Saddle Brook, N. J. Included in the catalog are complete information on uses of the thermocouples, and the calibrations, temperature ranges, materials of construction, and immersion lengths in which they are available. .....**Item 91**

RECORDER, RECORDING CONTROLLER—Bulletin 979 describes two additions to the line of pressure and temperature controllers manufactured by A. W. Cash Co., Decatur, Ill. They are the Type 57 pneumatic recording controller and Type 58 recorder for pressure ranges from 0 to 5 and 0 to 25,000 psi, and temperature range from—350 to 1200 deg F. ....**Item 92**

FLUID DRIVES—Bulletin A-119, covering Type VS Class 2 Gyrol fluid drives in the 7½ to 800-hp range, is available from American Blower Corp., Detroit, Mich. A description of construction features is accompanied by an example of how these units operate. Cutaway view of a typical unit, selection tables covering the full line, installation-type drawings giving basic dimensions for each unit size, and various mounting arrangements are included. .....**Item 93**

PNEUMATIC CONTROL INSTRUMENTS—A 16-page catalog on pneumatic instruments for process control is published by United States Gauge, Div. of American Machine and Metals, Inc., Sellersville, Pa. Catalog 505 discusses indicating pilots, transmitters and receiver gages. Shown is the 3½ in. scanning diaphragm receiving gage with rotatable dial which permits the operator to rotate the dial to a common set point. Information on measuring elements for pressure and temperature applications, ordering, and dimensions and typical dial faces are included. .....**Item 94**

PREFABRICATED PIPING—A 28-page catalog describing its prefabricated insulated underground and overhead piping systems for steam, condensate, hot or chilled water, and other fluids, is issued by E. B. Kaiser Co., Glenview, Ill. Bulletin 100 gives information on the design, applications and installation of these systems, including technical data. Designs for any requirement are listed: simple or multiple inner pipe, casings of flanged cast iron, flanged steel, or welded steel. On-the-job installation is explained with step-by-step diagrams. Fittings and accessories are described. Photographs of typical installations show versatility of application. Technical data include flow tables, pressure drop curves, capacities, piping system data and suggested piping specifications. .....**Item 95**

BURNER IGNITION TRANSFORMERS—Its line of screw type, plug-in type, gas or oil ignition type transformers and bases, and high tension terminal accessories for oil and gas burners is published in Bulletin IT9-8-15-56 by Dongan Electric Mfg. Co., Detroit, Mich. Full specifications are included on each type, along with price data and an order blank. .....**Item 96**

JET ROOF VENTILATOR—Bulletin DJA-101 describing the exhaust performance capabilities and fire-fighting features of its jet axial roof ventilator is published by Detroit Blower Co., Franklin Park, Ill. The ventilator's high rate of efficiency in exhausting heat, smoke, dust and fumes at low rpms and its ability to reduce exhaust operation noise and air turbulence is discussed. .....**Item 97**

ELECTRIC BLAST COIL HEATERS—Its line of electric blast coil heaters for package air conditioners to replace steam or hot water coils is given in Bulletin E-97P published by Industrial Engineering and Equipment Co., St. Louis, Mo. Contents include construction details, air pressure drop curves, information on ordering listed and unlisted heaters, specifications, and thermostats. .....**Item 98**

AUTOMATIC CONTROLS—A booklet, available from Barber-Colman Co., Rockford, Ill., aids in the selection of electric and electronic automatic controls for heating and air conditioning systems. Operational and application data are presented for temperature and humidity controls, motor-operated valves, control motors, and accessories. .....**Item 99**

INSULATION SPECIFICATIONS—Data sheets to assist in the writing of insulation specifications for heating and air conditioning duct systems is announced by Baldwin-Hill Co., Trenton, N. J. Sheets detail approved specifications for attaching and finishing semi-rigid duct insulation. Three methods of attachment and four finishing techniques are described. Specifications for applying plain, vapor barrier, and coated duct insulation are included. .....**Item 100**

PLASTIC PIPE—Ace Rivicolor chemical-resistant unplasticized PVC pipe, fittings, and valves, are described in 8-page Bulletin CE-56 published by American Hard Ruber Co., New York, N. Y. Included are technical properties, a table of resistance to chemicals, data on sizes, pressures, and dimensions, and prices for pipe, fittings, and valves from ½ to 2 in. Instructions for threading, forming, and other installation operations are also given. **Item 101**

FORGED STEEL UNIONS—Complete dimensional and engineering data on its line of forged steel unions for high pressure service is announced in Bulletin U-1-56, published by W-S Fittings Div., H. K. Porter Co., Inc., Roselle, N. J. Types of unions described are: 3000 lb forged steel, designed to AAR dimensional specifications, 2-bolt and 4-bolt flange in 2000 lb and 3000 lb classes, 3000 lb O-ring flange, orifice, tab orifice, clamp ring, forged stainless steel, forged steel with bronze-to-steel and stainless-to-steel seats, and lug nut. ....**Item 102**

GLASS FIBER INSULATIONS—Three kinds of flame-blown glass fiber insulations used for thermal and acoustical applications and other of its products are described in Bulletin WPD-12 published by L. O. F. Glass Fibers Co., Toledo, Ohio. Charts are included illustrating acoustical and thermal values of the insulating blankets. .....**Item 103**

SQUIRREL CAGE MOTORS—Its line of squirrel cage, Design B drip-proof 1 to 40-hp motors is presented in 4-page Bulletin SB-1345, published by The Lincoln Electric Co., Cleveland, Ohio. Specifications are included. ..**Item 104**

(*Continued on page* 140)

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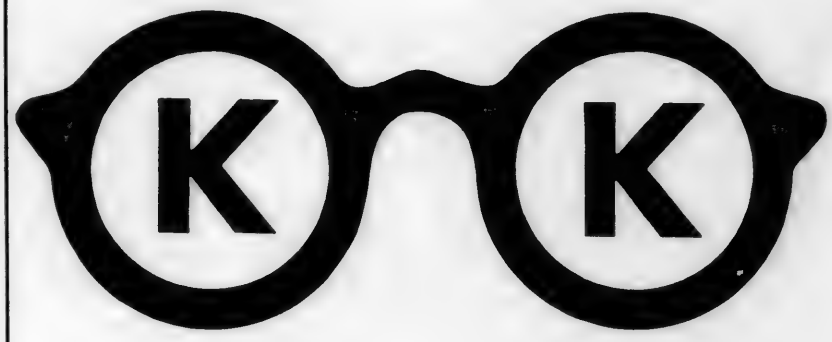
SEE



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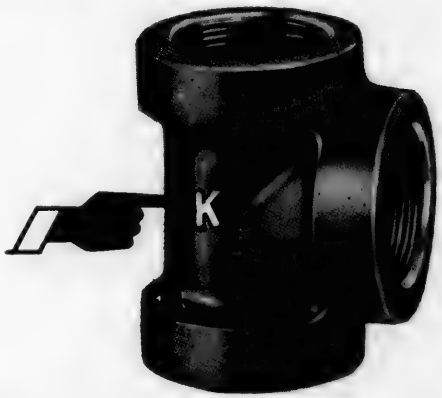

The "K" means fine workmanship

Looking at a "K" cast-iron pipe fitting, you'll see the smooth walls inside and out . . . the clean, sharp threads . . . the accurate machining. But many factors of a "K" fitting are not visible on the surface. They are the close grain and tensile strength and even thickness of the metal . . . the freedom from porosity, impurities, and defects.

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Many piping contractors and maintenance engineers insist upon getting "K" fittings from suppliers. It's a smart thing to do.

You are invited to ask for our condensed catalog.

THE KUHNS BROTHERS CO.

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Established 1887

Magnificent performance *Magnificent* styling

it's **Modine's** advanced-design **GAS UNIT HEATER**

5-10 minute conversion!

With a simple, low-cost conversion kit, this unit can be quickly converted from natural to LP, LP-air or mixed gas—and vice versa—with no change in burner or costly control alterations.

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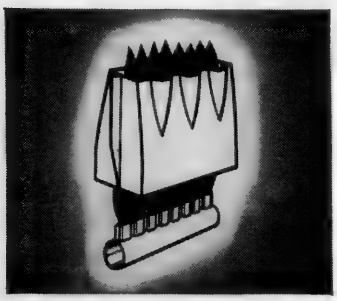
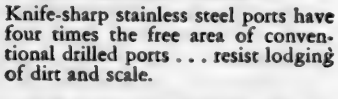


1. FAST, UNIFORM HEAT — Continuous, even flame from front to rear of individually and directly fired tubes boosts radiant heat absorption and uniform heat distribution.

FOR instant, uniform heat—when and where you need it—this compact, lightweight beauty is the answer. Low-cost efficiency and smart appearance make it ideal for any commercial, industrial or institutional application.

Modines are *up to 50% lighter* than other makes — cost less to ship, handle, install. And they require only minimum up-keep because of corrosion-resistant stainless steel burners and stainless or aluminized steel heat exchangers.

What's more, eight AGA-approved sizes are available from 25,000 to 310,000 Btu. For complete details, call the Modine representative in your classified phone book.



2. SELF-CLEANING PORTS — Knife-sharp stainless steel ports have four times the free area of conventional drilled ports . . . resist lodging of dirt and scale.

3. IMPROVED COMBUSTION — Hooded combustion air inlets below each tube improve burner efficiency and minimize flame disturbance.

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GAS UNIT HEATERS

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CITY.....ZONE.....STATE.....

GU-1338

NEW CATALOGS

(*Continued from page* 139)

Use the prepaid postcard on page 89 for securing your copies of catalogs described in this department.

CORROSION-RESISTANT EQUIPMENT— A 32-page catalog covering corrosion-resistant plastic equipment produced by Haveg Corp. Div., Haveg Industries, Inc., Wilmington, Del., is available. Complete coverage of a wide range of synthetic resin formulations, its glass-reinforced polyester, PVC, and Teflon equipment is given. The bulk of the catalog details pipes and fittings, valves, fume ducts and fume systems, tanks, towers, and accessory supplies, heat exchangers, pressure and vacuum equipment, and agitators. Also included are data on chemical-resistant cements, the field construction of plastic equipment, and the company's design service. . . . **Item 105**

FLEXIBLE AIR DUCT— Two data sheets dealing with the use of Wiremold flexible air duct in air conditioning installations are available from The Wiremold Co., Hartford, Conn. Sheet S-8 deals with the high velocity system installed in the new Socony Mobil Building in New York City. Sheet S-9 tells how flexibility is provided in the air conditioning of the new addition of the East Tennessee Baptist Hospital. . . . . **Item 106**

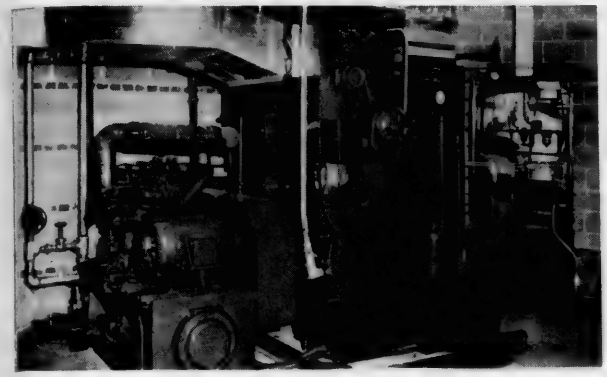
TYPE H COILS— For direct expansion or chilled water, Type H coils are described in Bulletin EM-J56110 published by Drayer-Hanson Div., National-U. S. Radiator Corp., Los Angeles, Calif. Illustrations, descriptions, and rating tables for both applications are included. . . . . **Item 107**

OPEN DRIP-PROOF MOTORS — Latest design features of its open drip-proof motors in NEMA rerated ratings of ½ to 40 hp, Type G, and in non-rerated ratings of ½ to 100 hp, Types AP and APWW, are described in Bulletin 51B6210G released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. In addition to cutaway views of the motor, the bulletin includes tables of ratings and dimensions as well as a horsepower frame chart. . . . . **Item 108**

AIR CONDITIONING EQUIPMENT— Its 1957 products bulletin is announced by Thermotank, Inc., Detroit, Mich., manufacturers of air conditioning equipment. Items included are: jet outlets for high-velocity distribution, drum louvers for air distribution in large areas, and mixing and sound attenuation chambers for single or dual duct-velocity systems, including ceiling and under-window models. Also presented are translucent diffusers, and diffusers integrated with sprinkler heads and acoustical treatments. . . . . **Item 109**

(*Continued on page* 142)

DRY AIR...
PRECISELY as you want it



NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

Write for full information; ask for Bulletins 112 and 121. Address Dept. H.V.

NIAGARA BLOWER COMPANY
405 Lexington Ave., New York 17, N. Y.
District Engineers in Principal Cities of U.S. and Canada

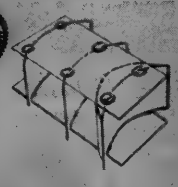
SAVE TIME and MONEY
when you form
FLEXIBLE CONNECTORS

ELGEN SILENT DUCT

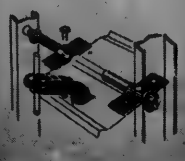
*Pats. Pend.

Imagine, this one-piece, factory-assembled metal-to-material unit unrolls absolutely *flat!* No more bothering with unwieldy duct material that buckles easily. Elgen Silent Duct makes on-the-spot work a cinch . . . you just measure and cut. You can fabricate *any type* of flexible duct connector in minutes . . . with half the effort! You can save up to 60%! No more worry about an inventory of "made-up" parts, either. Your choice of U.L. approved, (Gov't. Spec. Mil-D-10860) canvas, Johns-Manville asbestos and U. S. Rubber neoprene coated fibre glass, in 3" or 6" widths attached to 24 or 26 gauge galvanized steel or 24 gauge aluminum to fill every job requirement. All available in handy-to-use 25, 50 or 100 foot rolls.

2 More Elgen Products That Put Profits In Your Pocket!



ELGEN ALL-TITE VANE RUNNER
• Quickest and easiest way ever devised for installing turning vanes for square elbows • No special tools required; vanes lock easily with blow of hammer



ELGEN DAMPERSET
For Multi-Blade Dampers . . . Parallel or Opposed • Most perfect damper hardware developed • Assembles in a jiffy . . . cuts assembly time in half • Easily adjusted and self-aligning. Licensed by Minneapolis-Honeywell

ELGEN PRODUCTS ARE SOLD THROUGH LEADING JOBBERS EVERYWHERE.

"Put Profits In Your Pocket!"

Write today for free catalog and "spec" sheet!

ELGEN MANUFACTURING CORP. 41-34 39 Street, Long Island City, N. Y.

At the new Caterpillar Tractor plant in Decatur, Illinois, four Binks 2-K Series cooling towers play important roles in the manufacturing processes.

at Caterpillar's Decatur plant

Binks towers keep heat treating under cool control

The tough muscles of steel that make "Cat" motor graders and wheel tractors dependable work horses are no accident. All vital parts go through scientifically controlled heat treat processes.

Binks cooling towers play an important part in this process by controlling the temperature of quenching oils and water. They are also used to cool water that circulates to cool bearings in the electric induction heat treat furnaces.

Failure of the cooling equipment could be costly.

Dependability you can count on
Binks cooling towers are built to rigid specifications. All panels and framework are heavily galvanized and coated for long life and minimum maintenance. Fans are corrosion-resistant aluminum alloy. Scientifically balanced air-to-water ratios give high cooling efficiency under all climatic conditions.

A complete line
Whether it is for cooling process fluids or for use with air conditioning compressors, there's a Binks cooling tower, of the correct capacity and type for every job.

Send for complete data
Ask your Binks branch office for a copy of Bulletin 333 and Bulletin 477-A or write direct to the address below. Binks engineers will be glad to answer your questions and help you solve your cooling problems. There's no obligation.

685

Binks
EVERYTHING FOR WATER COOLING

Visit us in BOOTH 1172

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company
3120-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

NEW CATALOGS

(*Continued from page* 140)

Use the prepaid postcard on page 89 for securing your copies of catalogs described in this department.

LOW-PRESSURE BURNER — Bulletin AD-158, describing its low-pressure air atomizing burner, is announced by Hev-E-Oil Burner Div., Cleaver-Brooks Co., Milwaukee, Wis. Designed to burn low-cost residual oil, at low pressure, AM8E burner is rated at 90 gph. .....**Item 110**

AIR RELEASE VALVES — Air release valves, which are used for venting air from hot water heating systems, chilled water cooling and air conditioning systems, and to release air from industrial and municipal pipelines and other equipment as water mains, water filters, tanks, and brine lines are covered in Bulletin 856 published by The V. D. Anderson Co., a Division of International Basic Economy Corp., Cleveland, Ohio. Complete specifications and capacities are given for types with cast iron body in ½ through 1½-in. sizes for pressures up to 250 psi and a type with cast steel body in ½ and ¾-in. sizes for pressures up to 500 psi. Typical installation drawings for these units are shown. .....**Item 111**

BOOSTER WATER PUMP—Published by The Deming Co., Salem, Ohio, a data sheet describes the installation and use of its Cushionette water system for automatic booster pumping service. When connected between the city water and house service line, this system keeps pressure at any setting up to 70 psi. A schematic drawing shows a typical installations. .....**Item 112**

COAL AND COKE DUST-CONTROL—Bulletin 551-D, containing a discussion of the control of dust from coal and coke handling operations, is offered by Wheelabrator Corp., Mishawaka, Ind. It discusses the use of local exhaust ventilation and cloth-tube-type dust collectors, applicable to such operations as the conveying and preparation of coal for burning in industrial plant or power plant furnaces and boilers; the conveying, screening, and weighing of coke for charging foundry cupolas; the conveying, screening, crushing, weighing, and batching of coal in chemical processing; and the like. Four illustrated case histories, some diagrams of materials handling systems and how dust control is exercised in them, are presented. .....**Item 113**

SEAMLESS TUBING—Its line of small seamless tubing and small tubular components is covered in a 4-page brochure by Uniform Tubes, Inc., Collegeville, Pa. Aluminum alloy pointer tubing, metal-shielded wire, and seamless tubing (0.625 to 0.005 in. OD) are discussed. .....**Item 114**

(*Continued on page* 144)

PREVENT BREAKS AND LEAKS IN CONNECTIONS AND VALVES due to WATER HAMMER

with Josam

SHOCK ABSORBERS

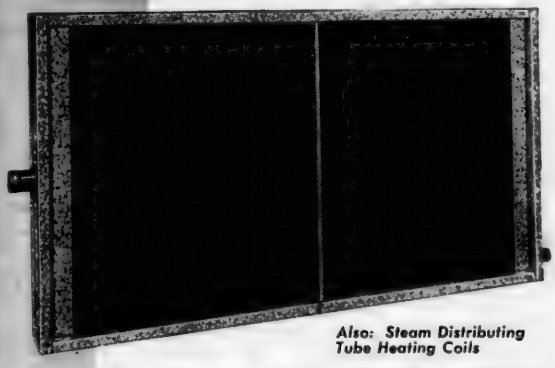
● The pounding, shaking noise that occurs repeatedly in many pipe lines is "Water Hammer" — as destructive as it is noisy — loosening fittings, damaging valves, connections and appliances, and causing extensive repairs!

JOSAM SHOCK ABSORBERS easily, inexpensively and permanently prevent hammering and vibration in pipe lines.

Write for free literature and latest scientific data.

JOSAM MANUFACTURING COMPANY
Dept. HV-1 Michigan City, Indiana
Representatives in all principal cities.
Josam products are sold through plumbing supply wholesalers.

RIGIDBILT **STANDARD STEAM HEATING COILS**



Also: Steam Distributing Tube Heating Coils

MAXIMUM HEAT TRANSFER ASSURED!

All tube outlets from header are extruded, providing double thickness for tube insertions. Tubes are fabricated from 0.035" copper, nipple connections are brass, thus assuring strength for longer life with utmost economy.

RIGIDBILT IS BETTER BUILT — Write for Catalog

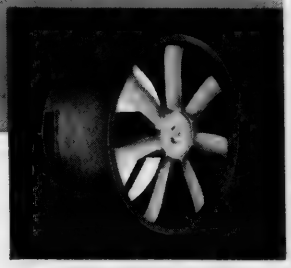
RIGIDBILT INC.

2852 WEST FULTON BLVD., CHICAGO 12, ILL.

HEATING • AIR CONDITIONING • REFRIGERATION

"giving acid fumes the air..."

with new **Aerovent**



"SP-7" 7-blade semi-pressure DUCT FANS

Installed at the Columbus, Ohio plant of North American Aviation, Inc., new Aerovent "SP-7" Belt-Driven Duct Fans, with 7-blade "Macheta" Airfoil Propellers, remove acrid fumes and vapors from a spray-type processing machine. At temperatures of 180° to 200° F., the solution flashes into steam and noxious fumes which would contaminate the entire area if unabated. Located above each end of the spray section, and at intermediate points, the fans induce a steady flow of air through the unit to trap and remove heavy vapors at their source.

Recommended for resistances in the ¾" to 2½" S.P. range, these units, designed for all standard duct systems, move *more air* with less horsepower; provide greater mechanical efficiency with lower initial and operating costs. May be ordered with special-duty motors, alloy propellers and special protective coatings for extreme temperature, moisture or corrosive conditions.

WRITE FOR FREE BULLETIN NO. 400

"SP-7" FANS FOR ALL INDUSTRIAL REQUIREMENTS

DIRECT CONNECTED
Steel ring or square panel for wall, ceiling or penthouse. 14" to 60". Used with extended shaft for heat, moisture or corrosion.

DIRECT-DRIVEN DUCT
For installations which permit connection of entire fan assembly in air-stream. For vertical or horizontal use. 14" to 60".

"BI-FLO" DUCT
New divided-duct design, for air-supply or exhaust. Motor located out of airstream. Also serves as stack booster. Sizes 18" to 48".

"EFFICIENCY-ENGINEERED" equipment for every air-handling problem!

Aerovent FANS

Rated in accordance with Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Certified Ratings

Aerovent FAN CO. INC.

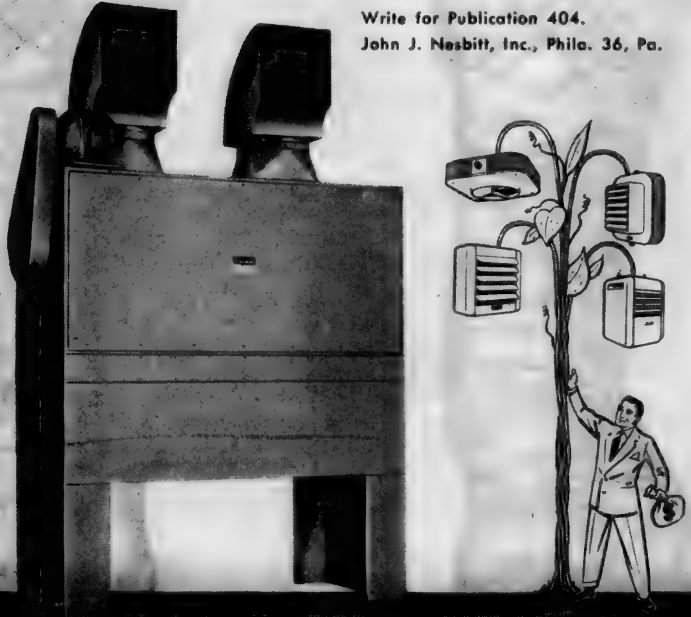
Ash and Brandt Sts. Piqua, Ohio

JACK and the GIANT

Once upon a time there was a heating contractor by the name of Jack. Now this wise fellow did a lot of industrial and commercial work, and he picked all his equipment from a big plant started by John J. Nesbitt more than 40 years ago. On this plant grow all kinds of industrial unit heaters: propeller fan, blower fan, and gas-fired heaters; and the biggest of them all, called the Giant.

Now one day Jack had a terrific big job to do, requiring a unit with heating capacity in excess of 1,500,000 Btu, so naturally he called upon the Nesbitt Giant, for he knew it could handle the job with the greatest of ease. After all was said and done, Jack—well he made a lot of *jack;* and he satisfied his customer as well.

Write for Publication 404.
John J. Nesbitt, Inc., Phila. 36, Pa.



Nesbitt

THE NAME TO GO BUY IN UNIT HEATERS

NEW CATALOGS

(*Continued from page* 142)

Use the prepaid postcard on page 89 for securing your copies of catalogs described in this department.

LUMBER DRIER— An 8-page bulletin (No. 1232) on its Dryalator, a packaged device for automatically drying lumber is available from Orr & Sembower, Inc., Reading, Pa. Illustration showing the equipment, with pneumatic recording controls, steam heating coils, and labor-time saving instrumentation are provided, as well as operating views of the kiln. Schematic drawings of a typical installation fully outline the way in which the unit works. Complete specifications are provided on kiln and boiler installation. .....**Item 115**

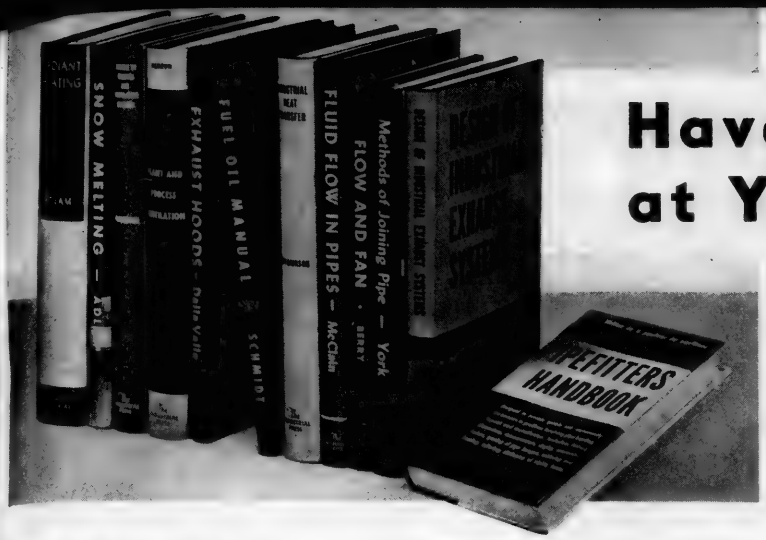
MOTOR SELECTOR—A 12-page motor selection bulletin is published by Reliance Electric and Engineering Company, Cleveland, Ohio, giving full information on how to select a-c motors for specific applications. Included in Bulletin B-2103-1 are such selection data as speed-frequency relationship, NEMA design classes, torque characteristics, NEMA current and torque values, frame selection tables, and dimension charts and mechanical modifications for all frame sizes from 182 to 6085. Two pages are devoted to a pictorial glossary of motor enclosure terminology. .....**Item 116**

CONTINUOUS BLOWDOWN SYSTEM— A 2-page brochure (Bulletin 65) describing its continuous blowdown system is available from The Whitlock Mfg. Co., West Hartford, Conn. System is explained with text and illustrated diagram. .....**Item 117**

AIR-CONDITIONER FAN MOTORS — Bulletin GEA-6533, available from General Electric Co., Schenectady, N. Y., illustrates advanced construction features of new type KCP, permanent-split capacitor fan motors for room air conditioners. 8-page publication includes data which points out motors' speed versatility, low temperature rise, high power factor, and other design advantages. ...**Item 118**

COLD WATER PLASTIC PIPE—Resistance to environmental stress cracking and to weathering, the two characteristics that impart superior durability to cold water pipe extruded from Tenite polyethylene, are discussed in a folder available from Eastman Chemical Products, Inc., Div., Eastman Kodak Co., New York, N. Y. Also outlined are suggested applications in which pipe may be used for conveying cold water. These include many farm, home, municipal and industrial uses. .....**Item 119**

(*Concluded on page* 146)



Have You the Facts at Your Fingertips?

Would you like to save time? Get accurate information? A few minutes invested now may save you hours on your next job. You'll find your questions answered quickly, simply and correctly in these valuable books. Choose the ones you need and mail the coupon now. You'll be glad you did.

DESIGN OF HEATING AND VENTILATING SYSTEMS

Includes 96 full-page charts to solve your problems of heating and ventilating involving load determination, duct design, panel heating, solar heating and combustion analysis. Opposite each chart is a design example and the solution illustrating the use of each method. The text clearly explains the engineering background and the mathematical basis of each chart.

320 Pages, 96 Charts, $7.00.
In Canada or overseas, $7.80.

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS

How to design, build or buy an exhaust system that will function adequately and economically, and meet the requirements of law and industrial hygiene. Covers flow of fluids—hood forms—air flow through hoods—pipe resistance—piping design—dust separators—low pressure conveyors—centrifugal exhaust fans—structural details—field measurements and their interpretation.

252 Pages, 122 Illustrations, $3.50.
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EXHAUST HOODS

Practical hood design, including the latest principles of air handling, contaminant dilution and transport velocities. Includes design of hoods for control of dust, mist, fumes, vapors and gases with many particular references to processes such as bagging, drilling, screening, grinding, welding, plating and many others. Simple formulas and diagrams show exact procedures.

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FLOW AND FAN

The *flow* of gas through ducts, and *fan* performance and control are authoritatively covered in this useful work. Covers principles of moving air through ducts, including elements of fan selection and control, duct arrangement, system characteristics and flow analysis. Gives basic data and describes methods used to calculate system resistance, plus practical information that will help in selecting a fan for a given duty.

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FLUID FLOW IN PIPES

How to solve problems involving the flow of liquids and gases through pipes. Shows how to handle viscosity, friction, head, and other factors expressed in various dimensional systems. Applications of the principles to problems in piping are presented with worked-out examples.

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Covers characteristics and uses of every type and grade of fuel oil. Explains the meaning of each oil property, and shows how this information is applied in selecting, handling and burning fuel oil. A special chapter covers fuel oil additives and how they are used, and another covers troubles encountered in using fuel oil and shows correct remedies.

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The basic principles, the experience-proved facts, the practical working data on applications of radiant energy for heating and cooling. Facts and figures can be applied directly in designing and installing radiant heating systems. Easy-to-use charts give most of the design data without calculation.

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A valuable handbook of correct, *tested* practice that covers the steps in planning, designing, building and operating snow melting systems of all sizes and types. Time-saving charts, tables and graphs give all the necessary data and simplify every step from preliminary planning to final operation.

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NEW CATALOGS

(*Continued from page* 144)

STAMPED METAL GRILLES—Its line of stamped metal grilles of plain lattice, shell, gothic, square link, and other design for heating and ventilating is illustrated in Catalog 202 published by Tuttle & Bailey Div. of Allied Thermal Corp., New Britain, Conn. Complete data are given including specifications on standard methods of fastening in walls and floors, and a list of the company's branch offices and representatives. .....**Item 120**

POWER VENTILATORS—Roof and sidewall ventilator Catalog C-5-B, with engineering data on five different series, is available from Carnes Corp., Verona, Wis. In addition to back draft dampers and motor controls, catalog includes the company's centrifugal sidewall ventilator. .....**Item 121**

THERMAL CONDUCTIVITY ANALYZER—The principle, construction, operation and features of its Condu-Therm Analyzer and Acratron Electronic Recorder is explained in 12-page Bulletin 56-1008-59, published by The Hays Corp., Michigan City, Ind. Analyzer can be used for determining amount of CO_2, H_2, He, and CH_4 and employs the thermal conductivity method of analysis. A special section on gas sampling systems and the use of this analyzer is included. .....**Item 122**

PERIMETER INSULATION—Design, application, and test data are given in a 4-page bulletin on perimeter insulation by U.S. Mineral Wool Co., Stanhope, N.J. Four line cuts show proper installation of insulation on foundation walls and floor slabs for existing buildings and new construction. Heat loss data and insulation sizes are included. .....**Item 123**

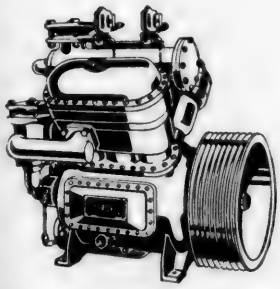
SOIL PIPE—An 8-page booklet covers the manufacture of soil pipe cast by centrifugal force, or spun. It is available from The Central Foundry Co., Newark, N. J. Questions and answers together with line drawings give the arguments for the patented process that employs all-metal molds for casting. Benefits to the installing plumber are detailed. .....**Item 124**

UNIT AND BLAST HEATERS—Catalog GP 956, describing GRID cast iron steam heat transfer surface unit heaters (both horizontal and down blow), blast heaters, and radiators, with general treatment on corrosion in unit heaters is available from D. J. Murray Mfg. Co., Wausau, Wis. Described are one-piece construction high-test cast iron heating sections together with air distribution charts, heating capacities, and tables. .....**Item 125**

Use the prepaid postcard on page 89 for securing your copies of catalogs described in this department.

TRADE FRICK MARK®

Air Conditioning Serves Throughout this Unique Hotel



Nine Frick "ECLIPSE" Compressors Air-Condition the Claypool Hotel at Indianapolis

Famed as the first COMPLETELY air-conditioned large hotel north of the Mason-Dixon Line, the Claypool at Indianapolis selected Frick equipment because it had used Frick Refrigeration for food service since 1939.

Nine Frick "ECLIPSE" compressors, installed by Decker and Roberts of Fort Worth, carry the air conditioning load, which is divided into three systems.

You get the utmost in air conditioning, ice making, quick freezing and cooling services when you specify "Frick." Let us quote now on your commercial or industrial cooling needs.

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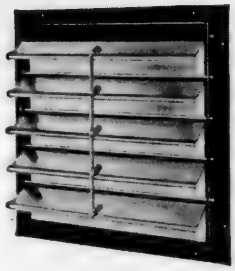
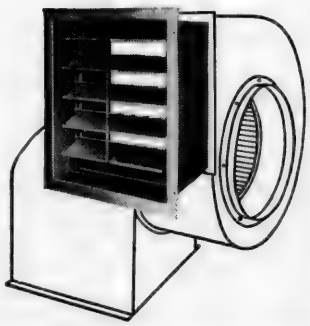
Famous Automatic Shutter

Unusually sensitive to air currents, causing the louvers to open instantly when the fan is turned on —and snap shut when the fan is turned off.

The aluminum louvers are weather-stripped. The best fitting shutter on the market.

Sizes from 12" to 72" square— also rectangular





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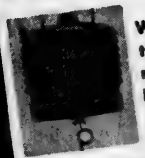
PANELBLOC



Where gas — either natural, manufactured or LP is available, the overhead PANELBLOC can be the answer to commercial and industrial heating problems.

This infra radiant heater is low in first cost — economical to install. Needs no electrical connection. No fans, motors or moving parts. Automatic, noise-free operation.

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Thermobloc Direct fired warm air heaters are installed in almost every type commercial and industrial structure ALL AROUND THE WORLD. World leader in sales, THERMOBLOCS are manufactured and sold in 27 countries.

Full range of sizes, gas, oil or combination gas-oil firing.

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Please send bulletins on ☐ Panelbloc ☐ Thermobloc

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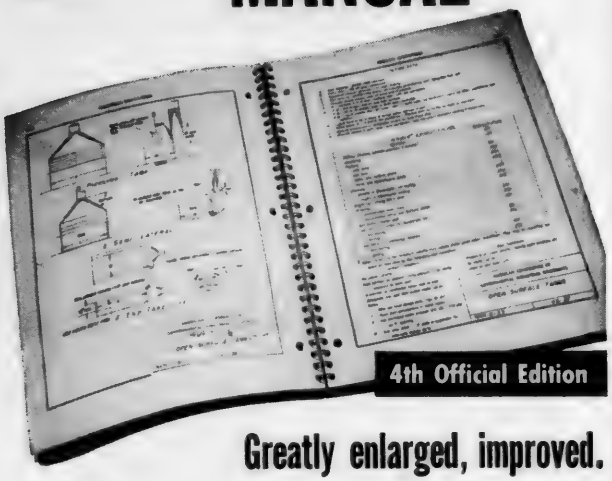
New! VENTILATION MANUAL



Greatly enlarged, improved. Many new tables on industrial ventilation.

Here's the latest edition of the authoritative Industrial Ventilation Manual—written by practicing field engineers. It's bigger, better . . . includes simple application drawings on most industrial ventilation operations. Invaluable to engineers and sheet metal fabricators.

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Dilution Ventilation	**Make-up and Recirculated Air**
Comfort Ventilation	**Construction Specifications**
Hood Design	**Testing of Ventilation Systems**
Specific Operations	**Fans**
Duct Design	**Air Cleaning Devices**

The Ventilation Manual is the official publication of the American Conference of Governmental Industrial Hygienists and is used as a basic text by many leading universities. It contains all the information needed for the complete design of industrial ventilation systems. The recommended ventilation practices are approved by Federal, State, and Municipal Government Industrial Hygiene Departments.

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PIPE LINE CONVEYS COAL

in pulverized form for a distance of 110 miles with the aid of three pumping stations.

According to a contract between the Cleveland Electric Illuminating Company and the Pittsburgh Consolidation Coal Company, 18 million tons of coal will be delivered over the next 15 years through a recently completed pipe line between Cadiz, Ohio, and Eastlake, Ohio.

This line of pipe with 10 in. ID was installed 4 ft below the ground surface over the total distance between the coal company's operation and the power station at Eastlake, 110 miles distant.

• **OPERATION**—Coal, which is crushed to fine sizes, is mixed with water to form a 50-50 mixture of coal and water and this slurry is pumped through the line with the aid of three pumping stations placed at various points along this line. The slurry travels at a speed of 3.5 miles per hour. By weight, during one hour, 150 tons of coal is delivered and with it 36,000 gal of water. Thirty hours elapse from the time the slurry enters the pipe line until the material is delivered to the power station.

The first step in welding the pipe sections. Three railroads are cooperating in this project, said to be the first commercial coal pipeline in the United States.

At the Lake Erie end, the coal is separated from the water and dried, and then sent directly to boilers in the power plant for producing electric power. The approximate cost of this line is $10 million.

• **PREPARATION**—After the lengths of pipe were welded together, the pipe surface was wire brushed to remove rust scale and other surface adulterants. A thin coal tar enamel was sprayed on cold as a primer coat. The second coat of coal tar enamel was applied at 350 deg F, and a machine used to wrap glass cloth around the pipe. The glass cloth became saturated with the enamel to form a protective shield for the pipe.

(News of the Month continued on page 150)

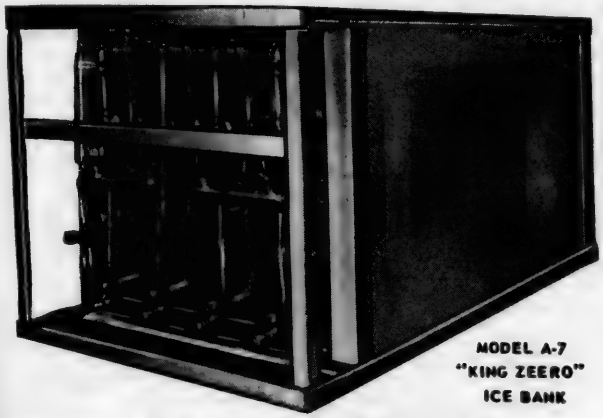
"King Zeero's" Sweet Water ICE BANKS offer ICE-CONCENTRATED Refrigeration for Air Conditioning

CONTINUOUS RIFLED GALVANIZED COILS
EXPANSION VALVE CONTROLLED

32°-34° ICE WATER COLD

DESIGNED FOR USE WITH:
FREON — METHYL CHLORIDE — AMMONIA

The "King Zeero" ICE BANK is designed for air cooling in Churches, Mortuaries, Theatres, Offices, Stores, Auditoriums, Factories, Clubs, Restaurants. etc. Ice Banks may be added to existing systems for increased capacity.



MODEL A-7
"KING ZEERO"
ICE BANK

CAPACITIES - 500 lbs. to 30,000 lbs. (72,000 B.T.U.'s to 4,320,000 B.T.U.'s) in a single unit. Multiple units may be installed.

The "King Zeero" ICE BANK is designed to deliver tons of 32 to 34 F. ice water for recirculation through air cooling coils. Peak loads many times compressor capacity are easily handled.

- DIRECTED COURSE OF WATER travels with "built-in" agitation.
- NO MECHANICAL AGITATION REQUIRED.
- LARGE WATER COMPARTMENTS spaced on 11" and 12" centers.
- 33% EXTRA ICE CAPACITY safely attained without freezing up.
- ICE IS "BURNED OFF" PLATE COILS progressively, exposing prime and secondary surface for maximum flash cooling capacity.
- ICE THICKNESS automatically controlled - eliminates "freeze ups."
- 94 SIZES to fit space requirements. Other designs for special applications.

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4300-14 W. Montrose Ave., Chicago 41, Ill.

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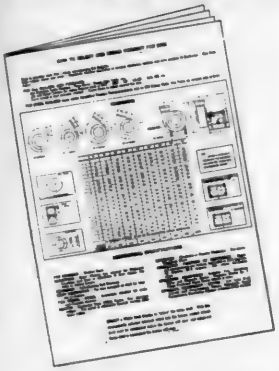
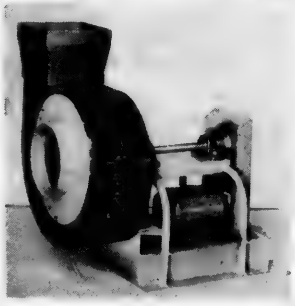
BETTER MADE
MORE FLEXIBLE
LARGE RESERVE CAPACITY

INDUCED DRAFT FANS





WRITE FOR SIMPLIFIED SELECTION DATA

- Save up to 35% installation costs.
- Fan chassis is steel platform, needing only four pipe floor stands or four ceiling bolts.
- Smaller chimney flue.
- Less costly breeching.
- Stub stack can be fastened to vertical discharge.

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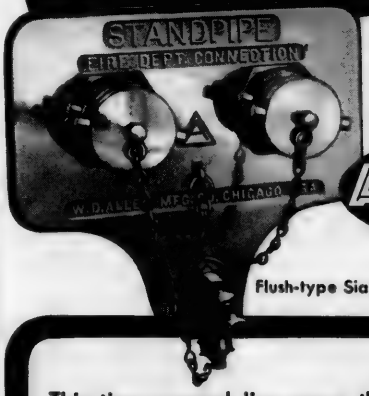
Interior Fire Protection involves more than most people see . . .



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This time-proved line more than meets specifications. It meets the highest standards of safety plus design, practicality and economy.

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Capacities of 56 standard and heavy duty models (6 to 30-inches diameter) . . . 140 CFM to 16,766 CFM with or without stacks. Greater capacities on special order.

★ NEW ACID-RESISTING FINISHES
★ NO FAN OBSTRUCTION IN EXHAUST LINE
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FOR HEATING PLANTS AND INCINERATORS. Quickdraft provides constant draft required for efficient and economical combustion. It prevents noxious concentrations of deadly fumes and dangerous accumulations of explosive gases from escaping into buildings. It eliminates pulsating or chattering, puffing, smoking and sooting. Quickdraft's acid-resisting vitreous enamel finish assures trouble-free performance.

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FOR MOVING AIR . . . in or out of buildings through ducts . . . Quickdraft is outstanding in efficiency.

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NUCLEAR ENERGY COMMITTEE

sees the package reactor as a near reality for power generation in areas of fuel scarcity.

It seems likely, according to the ASHAE Nuclear Energy Engineering Committee that in a few years package reactors will become economical for power generation in those parts of the world where other fuels are scarce. As costs come down atomic energy may eventually compete with conventional fuels in this country.

• **NUCLEAR FURNACE**— It is explained that the fusion or thermonuclear process for combining atoms has so far been utilized only in the H-bomb. In the foreseeable future only the fission process, making use of a nuclear reactor, offers controllable release of atomic energy at usable temperature levels. The nuclear fission reactor is a furnace which burns as fuel one of the radioactive elements.

All current evidence indicates that it may be feasible to use nuclear reactors in large size applications to provide central heating or heat-operated refrigeration for entire communities or groups of large buildings, but such use for home heating is technically and economically unsound.

• **FACTORS WEIGHED**— However, when used to generate heat or power the economic usefulness of atomic energy must be judged along with other fuels on an investment, operation and maintenance basis.

The design and construction features required to assure safety of nuclear furnaces add greatly to their cost, it is pointed out by the committee. Radiation shielding is bulky. Spent fuel must be replaced by remote handling techniques. Control equipment is complicated. Precautions to safeguard operating personnel are expensive.

AIR POLLUTION CONTROL

gains impetus by developments in New York City and campaign to find markets for fly ash and cinders.

Nationwide attention to the subject of air pollution control is becoming apparent with the subject being approached from many angles.

• **NEW YORK CITY**— Fuel users in New York City were given operational tips from the City Department of Air Pollution Control showing how to retain heat and reduce soot and odors. Some 200,000 fuel oil consumers were sent copies of a 4-page pamphlet pointing out that smoke, odors, soot, and oil films not only cause costly cleaning problems but are a nuisance and a menace to health. The pamphlet gave hints on pre-season and seasonal operation of oil burners and stressed that savings in fuel oil result when equipment is operated efficiently. A section was devoted to tips on heavy oil installations used in large buildings and factories.

• **NEW MARKETS**—Thirteen firms in the Pittsburgh area of Pennsylvania have joined in a program to find ways of marketing precipitated fly ash and cinders which are

(*Concluded on page* 152)

Airsan Viro Crimp

HIGH VELOCITY AIR FILTERS

VIRO CRIMP MEDIA
has special Hemmed Edges for strength and safe, easy handling. No cuts! No Scratches! No Filter surface damage.

- MAXIMUM EFFICIENCY (288 — 510 FPM)
- MINIMUM RESISTANCE
- NO DIRECT AIR PASSAGE
- LARGE DUST HOLDING CAPACITY

Also Available . . .
Low Velocity and Grease Filters.
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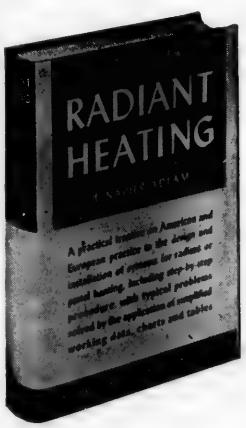
Write for details!



- **Basic Principles**
- **Working Data**
- **Facts on Radiant or Panel Heating**

"Radiant Heating," by T. Napier Adlam, provides basic information plus working data necessary to design and install efficient systems . . . covers radiant heating with ceiling, wall and floor panels, using all types of fuels . . . shows step-by-step procedure in laying out systems, using simplified charts that give most of the essential data without calculation. If you want authoritative answers to radiant heating questions, you'll find time-saving, money-saving solutions to your problems in this book. Send for your copy today!

504 Pages **$6.00** **337 Illustrations**
(In Canada or overseas, $6.90)

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93 Worth Street New York 13, N. Y.

Stuck Valves
Hard-to-Heat Spots
Frozen Pipes

Sluggish Materials
Underheated Rooms

Do something about it NOW!

This FREE book tells you how

Here's brand new application information on hundreds of uses of Chromalox Electric Heating Equipment for winter weather problems. These factual reports provide you with a rich source of ideas tailored strictly to winter heating problems in and around the plant and office.

Whether it's room heating, deicing, snow melting, warming of materials, or any of a hundred winter heating jobs, this exclusive information will show you how to solve the problem the electrical way.

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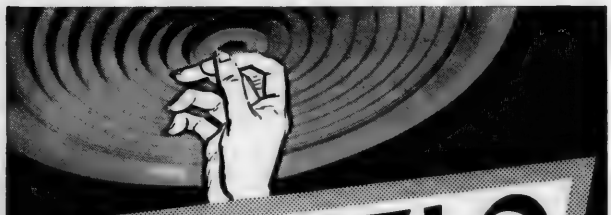

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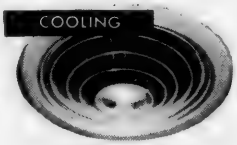
The Diffuser for Every Application

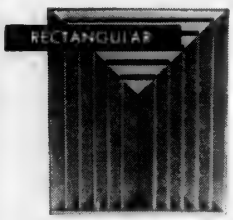
Here's the complete diffuser line with all extra features: built-in equalizing deflectors; easy to install; quick adjustment of air volume and diffusion pattern; simplified engineering; beautifully finished in any color baked enamel.

Let our sales engineers show you why Flexiflo is better for your jobs. But first — get the Flexiflo catalog.



Type R, constant flow pattern regardless of volume adjustment.

Type V, fully adjustable air diffusion pattern and volume.



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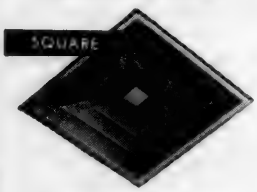

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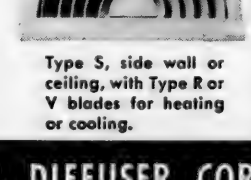

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NEWS OF THE MONTH

(*Concluded from page* 150)

piling up in storage yards throughout the district. T. C. Wurts, head of the Allegheny County Smoke Control Bureau, revealed that Dusquesne Light Co. has launched a campaign to find new uses for fly ash and cinders. The firm is experimenting with new concrete mixes which use fly ash instead of the customary gravel or slag. The West Penn Power Co. has also done considerable paving work to demonstrate highway application of fly ash. In addition it was reported that Bituminous Coal Research Bureau is actively promoting the use of fly ash as a material for making cinder blocks, concrete pipes, and precast concrete slabs used in bridges and large buildings.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

SOLAR ENERGY SYMPOSIUM—Two-day symposium on solar furnace design and operation, sponsored by the Association for Applied Solar Energy, in conjunction with Stanford Research Institute, Arizona State College and the University of Arizona, to be held at the Hotel Westward Ho, Phoenix, Ariz. J. I. Yellott, secretary of the Association, 3424 N. Central Ave., Phoenix, Ariz. ..... **JANUARY 21-22, 1957.**

ELECTRICAL ENGINEERS MEETING—Sinter general meeting of the American Institute of Electrical Engineers, at the Hotel Statler, New York, N. Y. Executive secretary of the Institute, 33 W. 39th St., New York 18, N. Y. ..... **JANUARY 21-25, 1957.**

PLANT MAINTENANCE SHOW—Eighth National Plant Maintenance and Engineering Show at the Public Auditorium, Cleveland, Ohio. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. ..... **JANUARY 28-31, 1957.**

INDUSTRIAL VENTILATION CONFERENCE—Sixth annual Industrial Ventilation Conference, to be held at Kellogg Center, Michigan State University, East Lansing, Mich. Public relations department of Michigan State, E. Lansing, Mich. ..... **FEBRUARY 18-21, 1957.**

ASHAE MEETING—63rd annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at the Conrad Hilton Hotel, Chicago, Ill. A. V. Hutchinson, executive secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **FEBRUARY 25-28, 1957.**

HEATING AND AIR-CONDITIONING EXPOSITION—13th International Heating and Air-Conditioning Exposition, at the International Ampitheater, Chicago, Ill. E. K. Stevens, manager, International Heating and Air-Conditioning Exposition Co., 480 Lexington Ave., New York 17, N. Y. ..... **FEBRUARY 25-MARCH 1, 1957.**

CORROSION ENGINEERS MEETING— 13th annual conference and exhibition of the National Association of Corrosion Engineers, at Kiel Auditorium, St. Louis, Mo. A. B. Campbell, executive secretary of the Association, 1061 M & M Building, Houston 2, Tex. ..... **MARCH 11-14, 1957.**

NUCLEAR CONGRESS—1957 Nuclear Congress to be held at Convention Hall, Philadelphia, Pa. Engineers Joint Council, 29 W. 39th St., New York 18, N. Y. ..... **MARCH 11-15, 1957.**

ATOMIC ENERGY CONFERENCE— Fifth conference on Atomic Energy in Industry, sponsored by the National Industrial Conference Board, at the Benjamin Franklin Hotel and Convention Hall, Philadelphia, Pa. Public information department of the National Industrial Conference Board, 460 Park Ave., New York 22, N. Y. ..... **MARCH 14-15, 1957.**

(*Concluded on page* 154)

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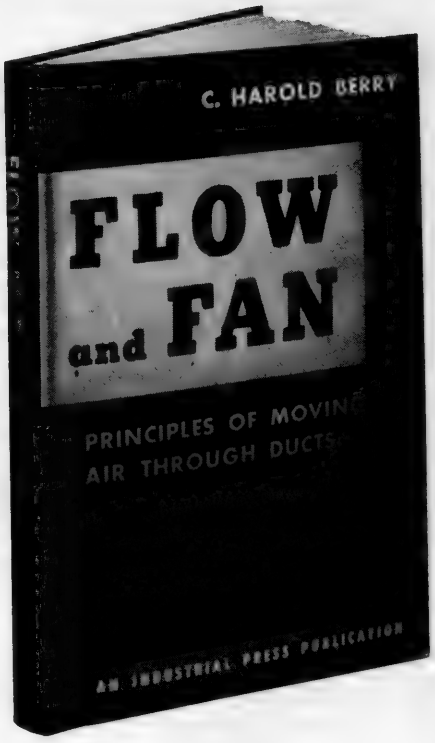

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(*Concluded from page* 152)

METEOROLOGICAL MEETING—151st National meeting of the American Meteorological Society, to be held at the University of Chicago, Chicago, Ill. Executive secretary of the Society, 5 Joy St., Boston 8, Mass. ..... **MARCH 19-21, 1957.**

METALS CONGRESS AND EXPOSITION—10th Western Metal Congress and Exposition, sponsored by the American Society for Metals, and other technical groups, at the Pan-Pacific Auditorium and the Ambassador Hotel, Los Angeles, Calif. W. H. Eisenman, managing director of the Society, 7301 Euclid Ave., Cleveland 3, Ohio. ..... **MARCH 25-29, 1957.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **APRIL 8-10, 1957.**

WARM AIR HEATING SHORT COURSE—1957 Warm Air Heating Short Course, sponsored by Purdue University, West Lafayette, Ind., to be held at the University. Prof. F. B. Morse, School of Mechanical Engineering, Purdue University, West Lafayette, Ind. ..... **APRIL 15-18, 1957.**

AIHA CONVENTION—Annual convention of the American Industrial Hygiene Association, at the Sheraton Hefferson Hotel, St. Louis, Mo. Secretary of the association, 4400 Fifth Ave., Pittsburgh 13, Pa. ..... **APRIL 22-26, 1957.**

REFRIGERATION INSTITUTE MEETING—Annual meeting of the Air-Conditioning and Refrigeration Institute, at The Homestead, Hot Springs, Va. Executive secretary of the Institute, 1346 Connecticut Ave., N. W., Washington, D. C. ..... **MAY 6-8, 1957.**

MECHANICAL CONTRACTORS MEETING—Annual meeting of The Mechanical Contractors Association of America (formerly Heating, Piping and Air Conditioning Contractors National Association) at the Hotel Fontainebleau, Miami Beach, Fla. L. B. Gruman, Jr., secretary of the Association, 30 Rockefeller Plaza, New York 20, N. Y. ..... **MAY 7-10, 1957.**

DESIGN ENGINEERING SHOW—Design Engineering Show to be held at the Coliseum, New York City. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. ..... **MAY 20-23, 1957.**

NDHA MEETING—48th annual meeting of the National District Heating Association, at The Homestead, Hot Springs, Va. J. F. Collins, Jr., secretary-treasurer of the Association, 827 N. Euclid Ave., Pittsburgh, Pa. ..... **JUNE 3-6, 1957.**

ASRE CONVENTION—44th annual meeting of the American Society of Refrigerating Engineers, at Hotel Fountainebleau, Miami, Fla. Secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **JUNE 3-6, 1957.**

TESTING MATERIALS MEETING—60th annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 16-21, 1957.**

ASHAE MEETING—Semi-annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at Murray Bay, Quebec. A. V. Hutchinson, executive secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **JUNE 24-27, 1957.**

CIVIL ENGINEERS EXHIBIT—Annual meeting and Civil Engineering Show of the American Society of Civil Engineers at Hotel Statler, New York, N. Y. Secretary of the Society, 33 W. 39th St., New York 18, N. Y. ..... **OCTOBER 14-18, 1957.**

INDUSTRIAL DEVELOPMENT CONFERENCE—International Industrial Development Conference, sponsored jointly by Time-Life International, and Stanford Research Institute, at the Fairmount Hotel, San Francisco, Calif. E. S. Prentice, executive secretary, Stanford Research Institute, Menlo Park, Calif. ..... **OCTOBER 14-18, 1957.**

AIR-CONDITIONING AND REFRIGERATION EXPOSITION — 10th exposition of the Air-Conditioning and Refrigeration industry, sponsored by the Air-Conditioning and Refrigeration Institute, at Chicago's International Amphitheater, Chicago, Ill. Secretary of the Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 18-21, 1957.**

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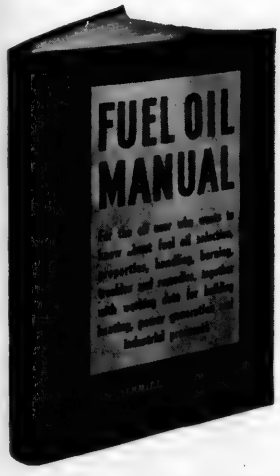

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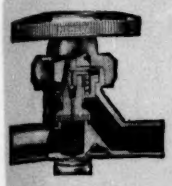

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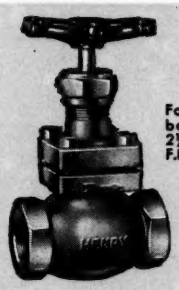

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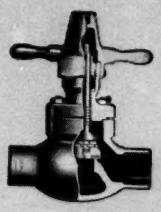

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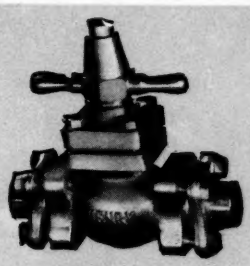

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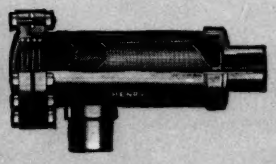

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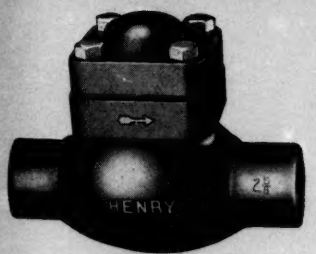

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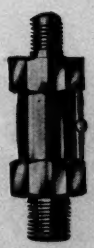

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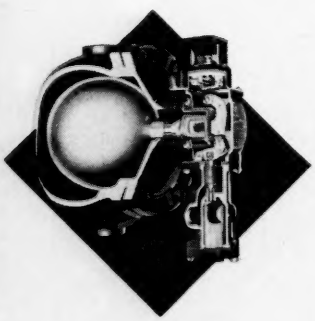

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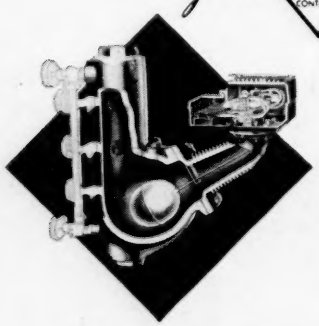

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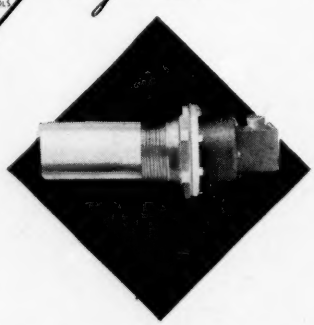

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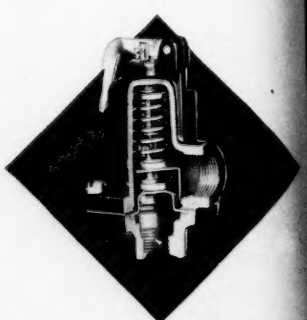

230 Series *Btu-rated Pressure Relief Valves* — for hot water space heating boilers. Complies with ASME Boiler Code in every way; rated and certified by National Board.

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